Remarks

The Invention

One embodiment of the invention (claims 60, 63, 66, 67, 69-71, and 73-75) provides a bisubstrate inhibitor of a protein kinase. The inhibitor comprises (1) a nucleotide or nucleotide analog moiety comprising a triphosphate, (2) a peptide moiety which is a substrate for said protein kinase and comprises a tyrosine residue, a 2-amino-3-(4-amino-phenyl)-propionic acid residue, a serine residue, a 2,3-diamino-propionic acid residue, a threonine residue, or a 2,3-diamino-butyric acid residue, and (3) a tether linked to the tyrosine residue via its phenolic oxygen, the 2-amino-3-(4-amino-phenyl)-propionic acid residue via its aniline nitrogen, the serine residue via its hydroxyl oxygen, the 2,3-diamino-propionic acid residue via its 3-amino nitrogen, the threonine residue via its hydroxyl residue, or the 2,3-diamino-butyric acid residue via its 3-amino nitrogen and linked to the nucleotide or nucleotide analog moiety via the gamma phosphate of the triphosphate. The tether is greater than or equal to 4.9 Å as measured from a gamma phosphorus of the nucleotide or nucleotide analog moiety to a proton donor of the tether formed by the phenolic oxygen, the aniline nitrogen, the hydroxyl oxygen, or the 3-amino nitrogen.

Another embodiment of the invention (claims 1-15, 58, 72, and 76) provides a bisubstrate inhibitor of insulin receptor kinase. The inhibitor comprises (1) a nucleotide or nucleotide analog moiety comprising a triphosphate, (2) a peptide moiety which is a substrate for said protein kinase and comprises a tyrosine residue or a 2-amino-3-(4-amino-phenyl)-propionic acid residue, and (3) a tether linked to the tyrosine residue via its phenolic oxygen or to the 2-amino-3-(4-amino-phenyl)-propionic acid residue via its aniline nitrogen and linked to the nucleotide or nucleotide analog moiety via the gamma phosphate of the triphosphate. The tether is greater than or equal to 4.9 Å as measured from a gamma phosphorus of the nucleotide or nucleotide analog moiety to a proton donor of the tether formed by the phenolic oxygen or the aniline nitrogen. One particular embodiment of the invention (claim 15) provides a bisubstrate inhibitor of insulin receptor kinase which is compound 2.

Claim Amendments

Claim 5-7 were amended to remove the commas between the amino acid residues of the recited peptide as suggested in the Office Action. The current format with a space between three letter codes for amino acids is the standard format in the art. Claim 15 was amended to recite "a bisubstrate inhibitor of insulin receptor kinase." Claim 4 was amended to recite "the peptide comprises a 2-amino-3-(4-amino-phenyl)-propionic acid residue." Claim 66 was amended to recite "a nitrogen atom replaces a hydroxyl oxygen on the tyrosine." The claims have not been narrowed in scope by these amendments.

Claims 1 and 60 were amended to recite that the nucleotide or nucleotide analog moiety comprises a triphosphate. Support can be found *inter alia* at page 7, paragraph 27: "Suitable moieties include ATP, ATPγ-S, GTP, CTP, TTP, UTP, GTPγ-S, CTPγ-S, TTPγ-S, [and] UTPγ-S." The nucleotides and nucleotide analogs described contain a triphosphate. Claims 1 and 60 were also amended to recite that the peptide moiety comprises a specific amino acid residue (tyrosine or 2-amino-3-(4-amino-phenyl)-propionic acid for claim 1; tyrosine, 2-amino-3-(4-amino-phenyl)-propionic acid, serine, 2,3-diamino-propionic acid, threonine, or 2,3-diamino-butyric acid for claim 60). Support for "tyrosine, 2-amino-3-(4-amino-phenyl)-propionic acid, serine, 2,3-diamino-propionic acid, threonine, and 2,3-diamino-butyric acid" residues can be found *inter alia* at page 8, paragraph 29:

> In order to make particular inhibitors with suitable tethers, the tyrosine residue of irktide is modified so that the phenolic oxygen is replaced with a nitrogen. Similarly, for the inhibitor of PKA, the serine residue is modified by substituting a nitrogen for the hydroxyl oxygen. Similarly, for threonine protein kinases, the hydroxyl oxygen can be replaced with a nitrogen.

Replacement of a phenolic oxygen atom of a tyrosine residue with a nitrogen atom results in 2–amino-3-(4-amino-phenyl)-propionic acid. The structures of 2–amino-3-(4-amino-phenyl)-propionic acid and tyrosine are detailed in Attachment 1. Additional support for 2-amino-3-(4-amino-phenyl)-propionic acid can be found in Figures 1A (compound 2) and 1C (the intermediate compound prior to addition of bromoacetic acid).

Replacement of a hydroxyl oxygen atom of a serine residue with a nitrogen atom results in 2,3-diamino-propionic acid. The structures of 2,3-diamino-propionic acid and serine are shown in Attachment 1. Additional support for 2,3-diamino-propionic acid can be found in Figure 4 (intermediate compound prior to addition of bromoacetic acid and compound 4).

Replacement of a hydroxyl oxygen atom of a threonine residue with a nitrogen atom results in 2,3-diamino-butyric acid. The structures of 2,3-diamino-butyric acid and threonine are shown in Attachment 1.

Claims 1 and 60 were further amended to recite that the tether is "linked to the tyrosine residue via its phenolic oxygen or to the 2-amino-3-(4-amino-phenyl)-propionic acid via its aniline nitrogen" (claims 1 and 60) or "linked to the serine residue via its hydroxyl oxygen, the 2,3-diamino-propionic acid residue via its 3-amino nitrogen, the threonine residue via its hydroxyl residue, or the 2,3-diamino-butyric acid residue via its 3-amino nitrogen" (claim 60). Support can be found in Figures 1A and 4. Claims 1 and 60 were also amended to recite that the tether is also "linked to the nucleotide or nucleotide analog via the gamma phosphate of the triphosphate. Support can be found, for example, in Figure 1A (compound 2) and Figure 4 (compound 4), both of which show a tether linked to a gamma phosphate.

Claims 1 and 60 were also amended to recite that the tether is greater than or equal to 4.9 Å measured from a gamma phosphorus of the nucleotide or nucleotide analog moiety to a proton donor <u>of the tether formed by the phenolic oxygen, the aniline nitrogen</u> (claims 1 and 60), or <u>the hydroxyl oxygen</u>, or <u>the 3-amino nitrogen</u> (claim 60)." Support can be found, for example, in Figures 1A and Figure 4, both of which show a tether linked to a proton donor.

No new matter is added by these claim amendments.

<u>The Rejection of Claims 1-15, 58, 60, 63, 66-67, 69-71, and 74-76 Under 35 U.S.C. § 112, Second Paragraph</u>

Claims 1-15, 58, 60, 63, 66-67, 69-71, and 74-76 stand rejected under 35 U.S.C. § 112, second paragraph as indefinite. In particular the rejection asserts that the recitation "the tether is ≥ 4.9 Å measured from a gamma phosphorus of the nucleotide or nucleotide

analog moiety to the proton donor" is indefinite because the specification fails to identify how a skilled artisan would perform such a measurement. Office Action, page 3, second paragraph. Applicants respectfully traverse this rejection.

The specification teaches the use of Cambridge Soft's Chem3D computer program package to calculate the distance between the gamma phosphorus of the nucleotide or nucleotide analog moiety and a proton donor of the tether assuming an extended conformation of the acetyl linker. "Distance between the anilino nitrogen and the gamma phosphorus was calculated using Chem3D assuming an extended confirmation of the acetyl linker." Page 4, paragraph 17. Thus, the distance between the gamma phosphorus and the proton donor is calculated using a three-dimensional conformation that is extended. "Extended" means that the structure is relaxed to allow the atoms (*i.e.*, the gamma phosphorus and the proton donor) to be as far apart as possible within a covalent structure, assuming standard atomic radii for the covalent bonds and standard bond angles. The specification clearly teaches a skilled artisan how to calculate the distance between the gamma phosphate and the proton donor.

Claim 15 also stands rejected under 35 U.S.C. § 112, second paragraph as indefinite because the terms "said insulin receptor kinase" and "the bisubstrate inhibitor of insulin receptor kinase" allegedly had no antecedent basis. Claim 15 was amended to recite "a bisubstrate inhibitor of insulin receptor kinase" in the preamble thus establishing proper antecedent basis for the two terms.

The Office Action also asserts that claim 66 is allegedly unclear in the recitation of "a nitrogen atom replaces a hydroxyl oxygen on a tyrosine" because the claims from which claim 66 depend do not require a tyrosine. Claim 63, the claim from which claim 66 depends, was amended to recite that the peptide moiety of the bisubstrate inhibitor comprises "a tyrosine residue."

Withdrawal of this rejection is respectfully requested in view of the amendment.

The Rejection of Claim 15 Under 35 U.S.C. § 112, First Paragraph

Claim 15 stands rejected under 35 U.S.C. § 112, first paragraph as allegedly containing new matter. In particular the rejection asserts that the recitation of "[a] bisubstrate inhibitor of insulin kinase" is new matter. The preamble of claim 15 was

amended to recite "a bisubstrate inhibitor of insulin receptor kinase." Withdrawal of this rejection is respectfully requested.

The Rejection of Claims 1-14, 58, 60, 63, 66-67, and 69-76 Under 35 U.S.C. § 112, First Paragraph

Claims 1-14, 58, 60, 63, 66-67, and 69-76 stand rejected under 35 U.S.C. § 112, first paragraph as allegedly failing to provide an adequate written description. In particular the rejection asserts that the application fails to disclose a representative number of species for the claimed genus of bisubstrate inhibitors of insulin receptor kinase or the claimed genus of bisubstrate inhibitors of protein kinases. Applicants respectfully traverse this rejection.

To satisfy the written description requirement for a claimed genus, the specification may describe a representative number of species (1) by actual reduction to practice, (2) by reduction to drawings, or (3) by disclosure of relevant identifying characteristics sufficient to show the applicant was in possession of the claimed genus. Manual of Patent Examining Procedure § 2163(II)(A)(3)(a)(ii). Relevant identifying characteristics can be, for example, structure or other physical and/or chemical properties, functional characteristics coupled with a known or disclosed correlation between function and structure, or a combination of such identifying characteristics. *Id.* A representative number of species is inversely related to the skill and knowledge in the art. *Id.* The specification need only describe in detail that which is new or not conventional. *Hybritech v. Monoclonal Antibodies*, 802 F.2d 1367, 231 U.S.P.Q. 81 (Fed. Cir. 1986).

Independent claim 1 and dependent claims 2-14, 58, 72, and 76 are directed to bisubstrate inhibitors of insulin receptor kinase. Independent claim 60 and dependent claims 63, 66-67, 69-71, and 74-75 are directed to bisubstrate inhibitors of protein kinases. The bisubstrate inhibitors of insulin receptor kinase and protein kinases comprise (1) a nucleotide or nucleotide analog moiety comprising a triphosphate, (2) a peptide moiety which is a substrate for the insulin receptor kinase or protein kinase, and (3) a tether. The peptide moiety of the bisubstrate inhibitors of insulin receptor kinase comprises a tyrosine residue or a 2-amino-3-(4-amino-phenyl)-propionic acid residue. The peptide moiety of the bisubstrate inhibitors of protein kinases comprises a tyrosine

residue, a 2-amino-3-(4-amino-phenyl)-propionic acid residue, a serine residue, a 2,3-diamino-propionic acid residue, a threonine residue, or a 2,3-diamino-butyric acid residue. The tether is linked to the tyrosine residue via its phenolic oxygen or to the 2-amino-3-(4-amino-phenyl)-propionic acid residue via its aniline nitrogen (claims 1 and 60). The proton donor also can be linked to the serine or threonine residues via their hydroxyl oxygen or to the 2,3-diamino-propionic acid or 2,3-diamino-butyric acid residues via their 3-amino nitrogen (claim 60). The tether also is linked to the nucleotide or nucleotide analog moiety via the gamma phosphate of the triphosphate. The tether is greater than or equal to 4.9 Å as measured from the gamma phosphorus of the nucleotide or nucleotide analog moiety to a proton donor formed by the phenolic oxygen, the aniline nitrogen, the hydroxyl oxygen, or the 3-amino nitrogen.

The Office Action asserts that the bisubstrate inhibitors of protein kinases (claims 60, 63, 66-67, 69-71, and 73-75) and the bisubstrate inhibitors of insulin receptor kinase (claims 1, 4, 8-14, 58, and 76) are unlimited with respect to the structures and positioning of the nucleotide or nucleotide analog moiety, peptide moiety and tether. More specifically, the Office Action alleges that the nucleotide or nucleotide analog moiety and peptide moiety can be linked in any manner.

Claims 1 and 60, as amended, recite identifying characteristics of the bisubstrate inhibitors of insulin receptor kinase and protein kinases, respectively. First, claims 1 and 60, as amended, recite a nucleotide or nucleotide analog moiety which comprises "a triphosphate." The triphosphate is a chemical and structural property of nucleotides or nucleotide analogs. Further structural properties are recited in claims 2, 3, 8, and 9. The recited nucleotide and nucleotide analog moieties are not unlimited with respect to structure.

Second, claims 1 and 60, as amended, recite a peptide moiety which comprises a specific amino acid residue. Claim 1, as amended, recites a peptide moiety which comprises a tyrosine residue or a 2-amino-3-(4-amino-phenyl)-propionic acid residue. Claim 60, as amended, recites a peptide moiety that comprises a tyrosine residue, a 2-amino-3-(4-amino-phenyl)-propionic acid residue, a serine residue, a 2,3-diamino-propionic acid residue, a threonine residue, or a 2,3,diamino-butyric acid residue. Further

structural properties are recited in claims 4-7, 10-14, and 69-71. Thus the peptide moiety is not unlimited with respect to structure.

Third, claims 1 and 60, as amended, recite identifying characteristics regarding the relationship between the nucleotide or nucleotide analog moiety and the tether. Claims 1 and 60, as amended, recite that the nucleotide or nucleotide analog moiety is linked to the tether "via the gamma phosphate of the triphosphate." Thus the positioning of the nucleotide or nucleotide analog moiety is not unlimited.

Identifying characteristics of the linkage between the peptide moiety and the tether are also recited. Claim 1, as amended, requires the tether to be linked to the tyrosine residue of the peptide moiety via its phenolic oxygen or to the 2-amino-3-(4-amino-phenyl)-propionic acid residue of the peptide moiety via its aniline nitrogen. Claim 60, as amended, requires the proton donor of the tether to be linked to the tyrosine residue of the peptide moiety via its phenolic oxygen, to the 2-amino-3-(4-amino-phenyl)-propionic acid residue of the peptide moiety via its aniline nitrogen, to the serine or threonine residues via their hydroxyl oxygen, or to the 2,3-diamino-propionic acid or 2,3-diamino-butyric acid residues via their 3-amino nitrogen. Thus the positioning of the peptide moiety is not unlimited.

The previous amendment (dated March 17, 2004) identified nineteen peptides that have been shown in the prior art to be natural substrates of insulin receptor kinase or to function as substrates for the insulin receptor kinase. All nineteen peptides contain a tyrosine residue. Using these nineteen peptides, the ten nucleotides and nucleotide analogs which comprise a triphosphate taught in the specification, a simple 2-carbon tether taught in the specification, and the linking requirements recited in claim 1, at least 190 bisubstrate inhibitors of insulin receptor kinase can be constructed (19 peptides x 10 nucleotides or nucleotide analogs x 1 tether = 190 bisubstrate inhibitors of insulin receptor kinase). Using a 2-amino-3-(4-amino-phenyl)-propionic acid residue for the tyrosine residue (as disclosed at page 8, paragraph 29) in each of the nineteen peptides an additional 190 bisubstrate inhibitors of insulin receptor kinase (19 peptides x 10 nucleotides or nucleotide analogs x 1 tether = 190 bisubstrate inhibitors of insulin receptor kinase) are disclosed. Thus, 190 bisubstrate inhibitors of insulin receptor kinase are disclosed. This is a representative number of species.

The peptide moiety of claim 60 "is a substrate for said protein kinase." Eighty-two peptides were identified in the previous amendment that were known in the prior art to be natural substrates of protein kinases or to function as substrates for the protein kinases. All 82 peptides identified contain a tyrosine residue, a serine residue, or a threonine residue. Eight-hundred-twenty bisubstrate inhibitors of protein kinases can be generated from these 82 peptides, the ten nucleotides and nucleotide analogs which comprise a triphosphate taught in the specification, a simple 2-carbon tether taught in the specification, and the linking requirements recited in claim 60 (82 peptides x 10 nucleotides or nucleotide analogs x 1 tether = 820 bisubstrate inhibitors of protein kinases). Using a 2-amino-3-(4-amino-phenyl)-propionic acid residue for the tyrosine residue, a 2,3-diamino-propionic acid residue for the serine residue, or a 2,3-diamino-butyric acid residue for the threonine residue (as disclosed at page 8, paragraph 29) in each of the 82 peptides an additional 820 bisubstrate inhibitors of protein kinases (82 peptides x 10 nucleotides or nucleotide analogs x 1 tether = 820 bisubstrate inhibitors of protein kinases) are disclosed. Thus, 820 representative species have been described in the specification.

The attached Declaration under Rule 132 of inventor Philip Cole (Attachment 5) presents data regarding an additional five bisubstrate inhibitors. These were made according to the teachings of the present application. The inhibitors are directed to five protein kinases distinct from those targeted by the inhibitors disclosed in the application. Each was found to be a potent inhibitor of its target enzyme. These data demonstrate that the species disclosed in the application are indeed representative of the claimed genus.

Thus, the specification discloses sufficient identifying characteristics of a representative number of species of the bisubstrate inhibitors of protein kinases and bisubstrate inhibitors of insulin receptor kinase. The specification teaches identifying characteristics of the peptide, of the nucleotide or nucleotide analog moieties, of the linkage between the nucleotide or nucleotide analog moiety and the tether, and of the linkage between the peptide moiety and the tether. One skilled in the art would reasonably conclude that the applicants had possession of the claimed genus of bisubstrate inhibitors of protein kinases and the claimed genus of bisubstrate inhibitors of

insulin receptor kinase when they filed the application. Withdrawal of this rejection is respectfully requested.

The Rejection of Claims 1-14, 58, 60, 63, 66 and 67 Under 35 U.S.C. § 112, First Paragraph

Claims 1-14, 58, 60, 63, 66 and 67 stand rejected under 35 U.S.C. § 112, first paragraph as allegedly failing to enable the genus of bisubstrate inhibitors of insulin receptor kinase or protein kinases. In particular, the rejection urges that undue experimentation would be required to practice the genus of bisubstrate inhibitors of protein kinase and the genus of bisubstrate inhibitors of insulin receptor kinase. Office Action, Paper No. 04122004, page 12, last paragraph. Applicants respectfully traverse this rejection.

An analysis of whether a claim is enabled by the specification requires a determination of whether the specification contains sufficient information, together with knowledge in the prior art, to enable one skilled in the art to make and use the claimed invention without undue experimentation. "The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation." *United States v. Telectronics, Inc.*, 857 F.2d 778, 8 U.S.P.Q.2d 1217 (Fed. Cir. 1988). Factors that may be considered in determining whether experimentation is undue include: (1) the breadth of the claims, (2) the nature of the invention, (3) the state of the prior art, (4) the level of one of ordinary skill, (5) the level of predictability in the art, (6) the amount of direction provided by the inventor, (7) the existence of working examples, and (8) the quantity of experimentation needed to make or use the invention based on the content of the disclosure. *In re Wands* 858 F.2d 731, 8 U.S.P.Q.2d 1400 (Fed. Cir. 1988). The specification need only describe in detail that which is new or not conventional. *Hybritech v. Monoclonal Antibodies*, 802 F.2d 1367, 231 U.S.P.Q. 81 (Fed. Cir. 1986).

The Breadth of the Claims

The Office Action asserts that undue experimentation would be required to make the genus of bisubstrate inhibitors of insulin receptor kinase and the genus of bisubstrate inhibitors of protein kinases. Specifically, the Office Action asserts that the bisubstrate

inhibitors comprise any nucleotide analog having any structure, any peptide substrate, and a tether having an undefined structure. Office Action, page 13, first paragraph. In addition, the Office Action asserts that the moieties can be linked in any manner. *Id.*

The claims have been amended so that the structure of the components and their relationship are better defined. The claims as amended positively recite a nucleotide or nucleotide analog moiety which comprises a triphosphate. The peptide moiety in the amended claims is a substrate for protein kinase or insulin receptor kinase and comprises a tyrosine residue or a 2-amino-3-(4-amino-phenyl)-propionic acid residue (claims 1 and 60). The peptide moiety of claim 60 as amended also can comprise a serine residue, a 2,3-diamino-propionic acid residue, a threonine residue, or a 2,3-diamino-butyric acid residue. The claims as amended recite a tether that links the nucleotide or nucleotide analog moiety to the peptide moiety through a gamma phosphorus on the triphosphate of the nucleotide or nucleotide analog moiety and the tyrosine residue via its phenolic oxygen, the 2-amino-3-(4-amino-phenyl)-propionic acid residue via its aniline nitrogen (claims 1 and 60). The tether of claim 60 as amended links the gamma phosphorus of the triphosphate to the hydroxyl oxygen on the serine residue or threonine residue, or to the 3-amino nitrogen atom on the 2,3-diamino-propionic acid residue or 2,3-diamino-butyric acid residue. Thus, the nucleotide or nucleotide analog moiety and peptide moiety have more defined structures, and the nucleotide or nucleotide analog moiety and peptide moiety are linked to the tether in a more specific arrangement. The breadth of the claims has been limited in these regards.

The claims recite a nucleotide or nucleotide analog moiety comprising a triphosphate. The recited nucleotide or nucleotide analog moiety does not comprise any nucleotide or nucleotide analog moiety having any structure, but rather has a defined structure which comprises a triphosphate. The breadth of the claims is limited in this aspect.

The claims also recite a peptide moiety which is a substrate for an insulin receptor kinase and comprises a tyrosine residue or a 2-amino-3-(2-amino-phenyl)-propionic acid residue (claim 1) or a substrate for a protein kinase and comprises a tyrosine residue, a 2-amino-3-(4-amino-phenyl)-propionic acid residue, a serine residue, a 2,3,-diamino-propionic acid residue, a threonine residue, or a 2,3-diamino-butyric acid residue (claim

60). Thus, the peptide moiety does not comprise any peptide substrate, but rather has a defined composition and function. The breadth of the claims is limited in this regard.

In addition, the claims recite a tether that is greater than 4.9 Å and is linked to the peptide moiety and to the nucleotide or nucleotide analog moiety in a specific arrangement. The tether is limited to a tether that is greater than 4.9 Å. For the bisubstrate inhibitors of insulin receptor kinase, the tether is linked to the tyrosine residue of the peptide moiety via its phenolic oxygen, or is linked to the 2-amino-3-(4-amino-phenyl)-propionic acid residue via its aniline nitrogen. The tether of the bisubstrate inhibitors of protein kinases is linked to tyrosine residue via its phenolic oxygen, the 2-amino-3-(4-amino-phenyl)-propionic acid residue via its aniline nitrogen, the serine or threonine residues via their hydroxyl oxygen, or the 2,3-diamino-propionic acid residue or 2,3-diamino-butyric acid residue via their 3-amino nitrogen. The tether also is linked to the nucleotide or nucleotide analog moiety via a gamma phosphate of the triphosphate. Thus, the tether is not linked to the nucleotide or nucleotide analog moiety and peptide moiety in any manner, but rather is linked in a prescribed manner. The breadth of the claims is limited in this regard.

The State of the Prior Art

The rejection asserts that the state of the prior art regarding bisubstrate inhibitors of protein kinases and insulin receptor kinase was not advanced. Office Action, page 14, lines 10-12. The reason stated is that the nucleotide analog and peptide can have any structure. In addition, the nucleotide or nucleotide analog and peptide can be linked to a tether in any arrangement.

As a preliminary matter, the claims have been amended, as detailed above, so that the nucleotide analog and peptide moieties have additional structural requirements. In addition, the claims have been amended so that the nucleotide or nucleotide analog, peptide and tether are linked in a prescribed manner. Thus it is no longer accurate to assert that any structure or arrangement is encompassed.

The state of the prior art was advanced at the time applicants filed their patent application. Nucleotides and nucleotide analogs which comprise a triphosphate were well known in the prior art. Applicants teach nucleotide and nucleotide analogs comprising a triphosphate. Page 7, paragraph 27: "Suitable moieties include ATP, ATPγ-

S, GTP, CTP, TTP, UTP, GTPγ-S, CTPγ-S, TTPγ-S [and] UTPγ-S." Each of the nucleotides or nucleotide analogs contains a triphosphate. In addition, other nucleotides and nucleotide analogs containing a triphosphate were well known in the art and were commercially available to the skilled worker. Examples of such nucleotides and nucleotide analogs include dATP, dCTP, dGTP, dTTP, ITP, dITP, 2',3'-dideoxy-ATP (ddATP), 2',3'-dideoxy-CTP (ddCTP), 2',3'-dideoxy-GTP (ddGTP), 2',3'-dideoxy-TTP (ddTTP), 8-bromo-ATP, 5-bromo-dUTP, 5-iodo-CTP, 5-iodo-dCTP, 5-iodo-UTP, 8-azido-ATP, 5-(3-aminoallyl)-2'-dUTP, 5-(3-aminoallyl)-ATP, and ribavirin-5'-triphosphate. See Attachment 2.

A host of both natural and non-natural peptide substrates were known in the art. As discussed above, applicant's identified in the prior response (dated March 17, 2004) nineteen peptides that were known in the art to be natural peptide substrates of insulin receptor kinase or were known to function as substrates of the insulin receptor kinase. See Attachment 3 for a list of such peptides. Eighty-two additional peptides also were identified in the previous amendment that were known in the art to be substrates of protein kinases. See Attachment 4. Thus, a skilled worker would only need to select from the known nucleotides and nucleotide analogs comprising a triphosphate, and to select from the known natural and non-natural peptide substrates, and to link the two moieties via a tether using the linking requirements taught in the specification and recited in claims 1 and 60. The state of the prior art was advanced at the time of filing with regard to the components for making the inhibitors of the invention.

The Skill in the Art

The rejection asserts that the level of skill in the art was insufficient to enable the bisubstrate inhibitors of insulin receptor kinase or protein kinases. The reason stated is that the bisubstrate inhibitors are unlimited with respect to the peptide moiety, nucleotide analog moiety, and tether. Office Action, paragraph bridging pages 14-15.

As a preliminary matter, the claims have been extensively amended so that the structures claimed are not unlimited as asserted.

The level of one of ordinary skill was high at the time applicants filed their patent application. The skilled worker in the field was a protein chemist. Such persons typically have a Ph.D. degree with several years of post-doctoral training. Such persons

would have knowledge of natural and non-natural peptide substrates, and of nucleotides or nucleotide analogs which comprise a triphosphate, as described in the prior art. In addition, the skilled worker could easily link a peptide moiety and a nucleotide or nucleotide analog moiety which comprises a triphosphate in accordance with the linking requirements taught in the specification and recited in claims 1 and 60. See Example 2, page 12. The reactions disclosed are standard coupling reactions run under standard coupling conditions, and are characterized as such at paragraph 41, lines 4-5.

Level of Predictability

The rejection asserts that the level of predictability is low because the specification fails to provide any guidance as to the way in which the nucleotide or nucleotide analog moiety, the peptide moiety, and the tether are physically linked.

As a preliminary matter the claims have been extensively amended so that the way in which the component moieties are linked is specified.

Because the prior art was rich and the skill level in the art was high, the level of predictability would also have been high. The specification teaches and claims 1 and 60 recite specific linking requirements for linking the nucleotide or nucleotide analog moiety and the peptide moiety. No reasons have been put forward why these components could not have been predictably joined. No reasons have been put forward why such joined components should not function in the intended manner. In fact, the attached Declaration of Dr. Philip Cole (Attachment 5) presents additional examples where the assembled components of bisubstrate inhibitors do function in the intended manner.

The Amount of Guidance

The rejection asserts that the specification fails to provide guidance for the composition and length of the tether. However, the specification teaches that the tether comprises carbon, hydrogen, or oxygen atoms. Page 8, paragraph 29. The length of the tether recited in the claims is greater than or equal to 4.9 Å measured from the gamma phosphorus of the nucleotide or nucleotide analog moiety and a proton donor formed by the phenolic oxygen, aniline nitrogen, hydroxyl oxygen, or 3-amino nitrogen. Guidance in how to calculate the length of the tether is taught at page 4, paragraph 17, lines 4-6. Thus the specification provides guidance for the composition of the tether and for the length of the tether.

Quality of Experimentation Needed

The rejection asserts that the amount of experimentation required to practice the invention would be undue because the nucleotide or nucleotide analog moiety and the peptide moiety can have any structure and there is no limitation to where the moieties are linked to the tether. However, as explained above, the claims as amended are not unlimited. The claims have been amended to recite a nucleotide or nucleotide analog moiety comprising a triphosphate, a peptide moiety comprising a tyrosine residue or a 2-amino-3-(4-amino-phenyl)-propionic acid residue (claims 1 and 60), or a serine residue, a 2,3-diamino-propionic acid residue, a threonine residue, or a 2,3,diamino-butyric acid residue. The claims also have been amended to recite a specific arrangement for the linkage of the nucleotide or nucleotide analog moiety and the tether, and the peptide moiety and the tether.

Given the breadth of the claims, guidance of the disclosure, the level of skill in the art, the level of predictability, and the state of the art, one of ordinary skill in the art could have practiced the invention without undue experimentation. All component parts of the claimed bisubstrate inhibitors were known. One of skill would merely need to assemble the parts using the linking requirements recited in claims 1 and 60. Such assembly would be routine and not require undue experimentation.

The Rejection of Claims 60, 67, 69-70, and 74 Under 35 U.S.C. § 102(b)

Claims 60, 67, 69-70, and 74 stand rejected under 35 U.S.C. § 102(b) as anticipated by Ricouart *et al.*, *J. Med. Chem.* 34:73-78, 1991. Applicants respectfully traverse this rejection.

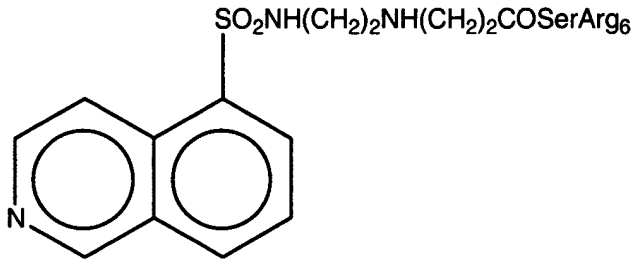
To anticipate a claim a reference must teach each and every limitation of the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 2 U.S.P.Q.2d 1051 (Fed. Cir. 1987).

Independent claim 60 and dependent claims 67, 69-70, and 74 are directed to a bisubstrate inhibitor of a protein kinase. The inhibitor comprises (1) a nucleotide or nucleotide analog moiety which comprises a triphosphate and (2) a peptide moiety. A

tether links the moieties. The tether is linked to the nucleotide or nucleotide analog moiety via the gamma phosphate of the triphosphate.

Ricouart is cited, *inter alia*, as teaching bisubstrate inhibitors that have alkyl groups substituted for phosphate groups on nucleotide analogs. "Ricouart et al. teach bisubstrate inhibitors of PKC comprising various ATP mimics having alkyl groups in place of the nucleotide phosphates . . . ." Office Action at page 17, paragraph 11.

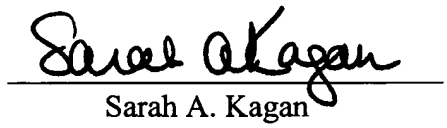
Ricouart teaches inhibitors of protein kinase A (PKA) and protein kinase C (PKC). Ricouart, page 74, Table II. Ricouart's inhibitors have an isoquinoline-5-sulfonamide and a Ser-Arg_6 peptide bound together by a linker (–$NH(CH_2)_2$-$NH(CH_2)_2CO$-). Abstract. An exemplary inhibitor taught by Ricouart is shown below.



The Ricouart inhibitors do not contain a nucleotide or nucleotide analog which comprises a triphosphate. Because the Ricouart inhibitors do not contain a triphosphate, the inhibitors also do not have a tether that is linked to the nucleotide or nucleotide analog moiety via a gamma phosphate group.

Applicants' independent claim 60 and dependent claims 67, 69-70, and 74, positively recite a nucleotide or nucleotide analog moiety "comprising a triphosphate." In addition, claim 60, and claims 67, 69-70, and 74, positively recite that a tether is linked to the nucleotide or nucleotide analog moiety via "the gamma phosphate of the triphosphate." Ricouart does not teach these two claim limitations. Thus, Ricouart cannot anticipate claims 60, 67, 69-70, and 74. Withdrawal of this rejection is respectfully requested.

Respectfully submitted,

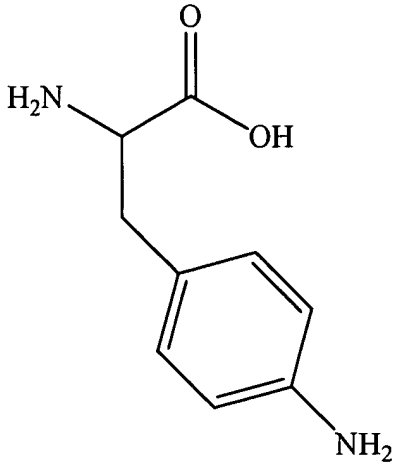
Dated: September 29, 2004 By: 

Sarah A. Kagan
Reg. No. 32,141

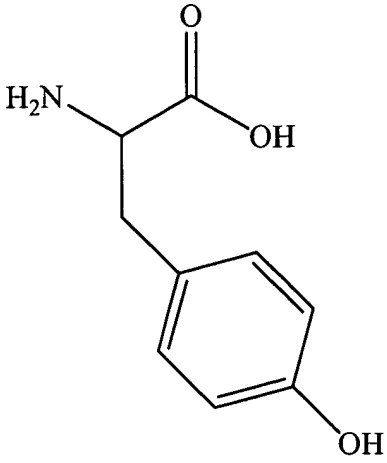
Banner & Witcoff Ltd.
Customer No. 22907

Attachment 1

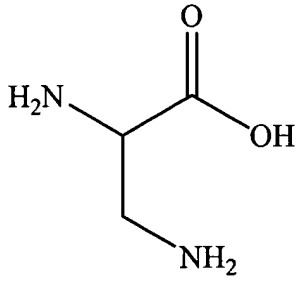
2-amino-3-(4-amino-phenyl)-propionic acid



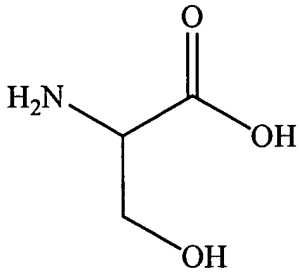
tyrosine



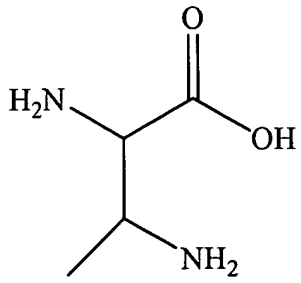
2,3-diamino-propionic acid



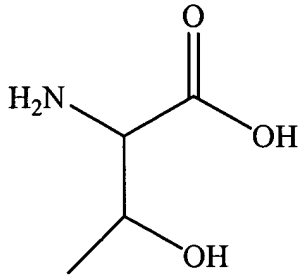
serine



2,3-diamino-butyric acid

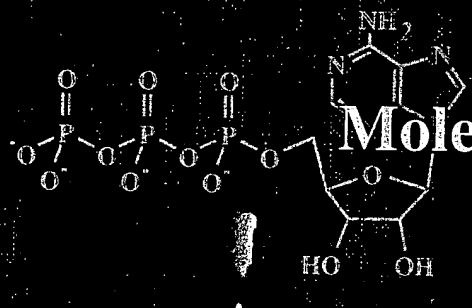


threonine



BIOCHEMICALS AND REAGENTS FOR LIFE SCIENCE RESEARCH

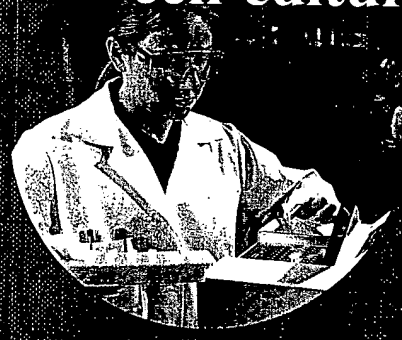
1998



Molecular Biology

SIGNAL TRANSDUCTION

cell culture



IMMUNOCHEMICALS

SIGMA®

PRODUCT NUMBER | US $

AMINO ACIDS, Protected (continued)

VALINE

MISCELLANEOUS

AMINO ACID SOLUTIONS

See: Tissue Culture Media and Reagents *Page 1752*

AMINO ACID STANDARD SOLUTIONS

See under: Protein Analysis Reagents *Page 2115*

9-AMINOACRIDINE
(Aminacrine)

A7295 RT
Free Base 5 g 23.75
Produces a hazy solution in ethanol. 25 g 76.25
[90-45-9] $C_{13}H_{10}N_2$ FW 194.2 100 g 209.45
R: 23/24/25-36/37/38-40 S: 45-26-36/37/39-22

A7135 RT
Hydrochloride 5 g 8.95
Minimum 98% 25 g 29.80
[52417-22-8] $C_{13}H_{10}N_2 \cdot HCl$
FW 230.7
R: 23/24/25-36/37/38-40 S: 45-26-36/37/39-22

7-AMINOACTINOMYCIN D

A9400 2-8°C
Approx. 97% (TLC) 1 mg 66.35
[7240-37-1] FW 1270.4 5 mg 245.65
R: 45-46-61-26/27/28 S: 45-26-36/37/39

AMINOACYLASE

See: Acylase I *Page 53*

AMINOACYL-L-PROLINE HYDROLASE

See: Prolidase *Page 934*

PRODUCT NUMBER | US $

AMINOACYL-tRNA SYNTHETASE

(EC Ligase sub-class 6.1.1)
Unit Definition: One unit will activate and attach 1.0 picomole (10^{-12} mole) of labeled amino acid to tRNA in 10 min at pH 7.6 at 37°C (amino acid used: L-arginine).
Protein determined by Biuret method.
[9028-02-8]

A 6302 -20-0°C
Crude: From Bakers Yeast 5,000 units 39.25
A mixture of amino acid activating enzymes in 50% glycerol solution containing 10 mM Tris HCl, pH 7.2, 10 mM $MgCl_2$, 30 mM 2-mercaptoethanol and 10 mM KCl. 10,000 units 62.00
Shipped in wet ice
Activity: 2,000-6,000 units per mg protein.

A 3518 -20-0°C
Crude: From Bovine Liver 10,000 units 62.00
A mixture of amino acid activating enzymes in 50% glycerol solution containing 10 mM Tris HCl, pH 7.6, 10 mM $MgCl_2$, 30 mM 2-mercaptoethanol and 10 mM KCl. Shipped in wet ice
Activity: 2,000-7,000 units per mg protein.

A 3646 -20-0°C
Crude: From E. coli 5,000 units 39.25
A mixture of amino acid activating enzymes in 50% glycerol solution containing 10 mM Tris HCl, pH 7.2, 10 mM $MgCl_2$, 30 mM 2-mercaptoethanol and 10 mM KCl. 10,000 units 62.00
50,000 units 138.85
Shipped in wet ice
Activity: 10,000-15,000 units per mg protein.

A 4637 -0°C
8-AMINOADENOSINE 3′:5′-CYCLIC MONOPHOSPHATE Free Acid 2 mg 50.20
5 mg 82.85
[30685-40-6] $C_{10}H_{13}N_6O_6P$ FW 344.2

A 1786 RT
β-AMINOADIPIC ACID 500 mg 105.15
(3-Aminohexanedioic acid)
[40967-78-0] $C_6H_{11}NO_4$ FW 161.2
R: 36/37/38 S: 26-36

A 7400 RT
D-α-AMINOADIPIC ACID 25 mg 13.75
(D-2-Aminohexanedioic acid) 100 mg 37.95
Glutamine synthetase inhibitor *in vivo*; amino acid antagonist 250 mg 75.80
[7620-28-2] $C_6H_{11}NO_4$ 1 g 210.50
FW 161.2

A 0637 2-8°C
DL-α-AMINOADIPIC ACID Minimum 99% 100 mg 6.80
Reduces kainate toxicity; glutamine synthetase inhibitor 250 mg 9.90
1 g 21.80
[542-32-5] $C_6H_{11}NO_4$ FW 161.2 5 g 98.90
10 g 178.10

A 7275 RT
L-α-AMINOADIPIC ACID 100 mg 14.40
(L-2-Aminohexanedioic acid) 250 mg 28.75
Competitive glutamate receptor antagonist; increases intracellular free Ca^{2+}; competitive inhibitor of glutamine synthetase and γ-glutamylcysteine synthetase 1 g 79.80
5 g 316.05
[1118-90-7] $C_6H_{11}NO_4$ FW 161.2

A 0410 -20°C
5-(3-AMINOALLYL)-2′-DEOXY-URIDINE 5′-TRIPHOSPHATE (AA-dUTP) **Sodium Salt Approx. 90%** 1 mg 80.10
5 mg 266.70
10 mg 444.40
[109921-28-0] $C_{12}H_{20}N_3O_{14}P_3$ FW 523.2 (for free acid)

A 5660 -0°C
5-(3-AMINOALLYL)URIDINE 5′-TRI-PHOSPHATE (AA-UTP) **Sodium Salt Approx. 80%** 1 mg 80.10
5 mg 266.70
10 mg 444.40
[75221-88-4] $C_{12}H_{20}N_3O_{15}P_3$ FW 539.2 (for free acid)

PRODUCT NUMBER | US $

6-AZAURIDINE 250 mg 9.30
A 1882 (6-Azauracil riboside) 1 g 21.95
2-8°C *See also:* 3-Deazauridine 5 g 67.05
Page 349
[54-25-1] $C_8H_{11}N_3O_6$ FW 245.2
R: 20/21/22-40 S: 22-36

8-AZAXANTHINE 1 g 9.80
A 2132 (8-Aza-2,6-dihydroxypurine)
RT **Minimum 85%**
[1468-26-4] $C_4H_3N_5O_2$ FW 153.1

AZELAIC ACID
(Nonanedioic acid)
[123-99-9] $C_9H_{16}O_4$ FW 188.2
R: 36/37/38 S: 26-36

A 2282 **Approx. 98%** 1 g 5.45
RT 10 g 9.55
25 g 19.10
100 g 45.00

A 2257 **Approx. 80%** 5 g 5.40
RT 25 g 8.10
100 g 11.40
500 g 20.05
1 kg 36.15

AZELAIC ACID-CARBOXY-^{14}C
See: Radiochemicals Section *Page 2123*

AZELAOYL CHLORIDE 5 g 11.60
A 7436 (Nonanedioyl dichloride)
-0°C **Approx. 98% (GC)**
◆ *[123-98-8]* $C_9H_{14}Cl_2O_2$ FW 225.1
R: 34 S: 26-28-27-36/37/39

L-AZETIDINE-2-CARBOXYLIC 50 mg 23.25
A 0760 **ACID** 100 mg 38.70
RT **Approx. 99%** 250 mg 77.40
Crystalline 1 g 215.00
A four-membered ring analog of L-proline.
[2133-34-8] $C_4H_7NO_2$ FW 101.1

8-AZIDOADENOSINE 100 mg 21.90
A 2768 *[4372-67-2]* $C_{10}H_{12}N_8O_4$
2-8°C FW 308.3

8-AZIDOADENOSINE 3':5'-CYCLIC 5 mg 27.80
A 1262 **MONOPHOSPHATE**
-0°C **Free Acid**
Approx. 95%
Reported to be of use in photoaffinity labeling
Ref.: Haley, B.E. and Hoffman, J.F., Proc. Natl. Acad. Sci. USA, **71**, 3367 (1974).
[31966-52-6] $C_{10}H_{11}N_8O_6P$ FW 370.2

8-AZIDOADENOSINE 5'-DI- 1 mg 22.10
A 6657 **PHOSPHATE** 5 mg 80.15
-0°C **Sodium Salt** 10 mg 140.10
Approx. 95%
Off-white powder.
Reported to be useful in photoaffinity labeling.
Ref.: Czarnecki, J., et al., Meth. Enzymol., **56**, 642 (1979).
[102185-14-8] $C_{10}H_{14}N_8O_{10}P_2$ FW 468.2 (for free acid)

8-AZIDOADENOSINE 5'-MONO- 1 mg 26.60
A 8141 **PHOSPHATE** 5 mg 88.05
-0°C **Ammonium Salt** 10 mg 146.55
Approx. 95%
Off-white powder.
Reported to be of use in photoaffinity labeling.
Ref.: Haley, B.E. and Hoffman, J.F., Proc. Natl. Acad. Sci. USA, **71**, 3367 (1974).
[102185-18-2] $C_{10}H_{13}N_8O_7P$ FW 388.2 (for free acid)

PRODUCT NUMBER | US $

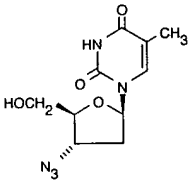
8-AZIDOADENOSINE 5'-TRI- 1 mg 26.05
A 5152 **PHOSPHATE** 5 mg 85.65
-0°C **Sodium Salt** 10 mg 142.55
◆ **Minimum 75%** Shipped in dry ice
Light tan powder.
Useful in photoaffinity labeling.
Ref.: Czarnecki, J., et al., Meth. Enzymol., **56**, 642 (1979).
[53696-59-6] $C_{10}H_{15}N_8O_{13}P_3$ FW 548.2 (for free acid)

4-AZIDOBENZOIC ACID 50 mg 29.40
A 9048 **N-HYDROXYSUCCINIMIDE** 100 mg 49.00
-0°C **ESTER** 500 mg 213.40
(N-Hydroxysuccinimidyl 4-azidobenzoate)
Minimum 95%
A photoactivatable, heterobifunctional cross-linking reagent
Ref.: Galardy, R.E., et al., J. Biol. Chem., **249**, 3518 (1974).
[53053-08-0] $C_{11}H_8N_4O_4$ FW 260.2

8-AZIDO-CYCLIC ADENOSINE Nucleotide
A 6830 **DIPHOSPHATE-RIBOSE** 100 µg 376.20
-20°C **Minimum 95% (HPLC)**
Lyophilized powder containing approx. 50% sodium chloride
Photoaffinity labelled; analog of cyclic ADP-ribose
Ref.: Walseth, T.F. and Lee, H.C., Biochim. Biophys. Acta, **1178**, 235 (1993).
[150424-94-5] $C_{15}H_{20}N_8O_{13}P_2$ FW 582.3

2'-AZIDO-2'-DEOXYCYTIDINE 10 mg 70.15
A 7783 May contain up to 5% inorganic salts.
-0°C *[51034-68-5]* $C_9H_{12}N_6O_4$ FW 268.2

3'-AZIDO-3'-DEOXYTHYMIDINE 25 mg 24.35
A 2169 (AZT; Azidothymidine) 100 mg 67.35
-0°C 250 mg 148.10



[30516-87-1] $C_{10}H_{13}N_5O_4$
FW 267.2
R: 23/24/25 S: 45-36

AZIDOTHYMIDINE, ANTIBODY TO
See: Immunochemicals *Page 1361*

3'-AZIDO-3'-DEOXYTHYMIDINE-2-^{14}C
See: Radiochemicals Section *Page 2123*

3'-AZIDO-3'-DEOXYTHYMIDINE 5 mg 19.05
A 0679 **β-D-GLUCURONIDE** 25 mg 87.55
RT (AZT glucuronide) 100 mg 242.90
Sodium Salt
Minimum 97% (HPLC)
[133525-01-6] $C_{16}H_{20}N_5O_{10}Na$ FW 465.4
R: 23/24/25-36/37/38 S: 45-26-36/37/39-22

3'-AZIDO-3'-DEOXYTHYMIDINE-METHYL-^{3}H
See: Radiochemicals Section *Page 2123*

3'-AZIDO-3'-DEOXYTHYMIDINE 25 mg 115.25
A 6806 **5'-MONOPHOSPHATE** 50 mg 201.65
-0°C (AZT monophosphate)
Sodium Salt
Approx. 98%
[29706-85-2] $C_{10}H_{14}N_5O_7P$ FW 347.2 (for free acid)
R: 20/21/22 S: 36

PRODUCT NUMBER

3'-AZIDO-3'-DEOXYTHYMIDINE-2-^{14}C 5'-MONOPHOSPHATE
See: Radiochemicals Section *Page 2123*

2'-AZIDO-2'-DEOXYURIDINE 25 mg
A 1021 *[26929-65-7]* $C_9H_{11}N_5O_5$
-0°C FW 269.2
R: 36/37/38 S: 26-36

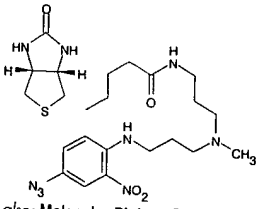
3'-AZIDO-2',3'-DIDEOXYURIDINE 10 mg
A 4810 **Minimum 98% (TLC)** 50 mg
-0°C Inhibitor of HIV replication
Ref.: 1. Lin, T-S. and Mancini, W.R., J. Med. C **26**, 544 (1983).
2. Zhu, Z., et al., Mol. Pharmacol., **38**, 929 (1
[84472-85-5] $C_9H_{11}N_5O_4$ FW 253.2

AZIDOFLUORESCEIN DIACETATE 25 mg
A 4511 (Azido-FDA)
2-8°C **Approx. 95% (HPLC)**
A photolabelling reagent in membrane viscosity studies.
Ref.: Rotman, A. and Heldman, J., Biochem., 2 5995 (1981).
[77162-07-3] $C_{24}H_{15}N_3O_7$ FW 457.4

N-(5-AZIDO-2-NITROBEN- 50 mg
A 3282 **ZOYLOXY)SUCCINIMIDE** 100 mg
2-8°C **Approx. 95%**
Photoactive, heterobifunctional cross-linking re
Ref.: Lewis, R.V., et al., Biochemistry, **16**, 565 (1977).
[60117-35-3] $C_{11}H_7N_5O_6$ FW 305.2

6-(4-AZIDO-2-NITROPHENYL- 50 mg
A 3407 **AMINO)HEXANOIC ACID** 100 mg
-0°C **N-HYDROXYSUCCINIMIDE ESTER**
(N-Succinimidyl 6-[4-azido-2-nitroanilino]hexano
Minimum 95%
Photoactive, heterobifunctional cross-linking rea
Ref.: Ballmer-Hofe, K., et al., Anal. Biochem., **1** 246 (1983).
[64309-05-3] $C_{16}H_{18}N_6O_6$ FW 390.4

N-(4-AZIDO-2-NITROPHENYL)- 500 µg
A 1935 **N'-(3-BIOTINYLAMINO-** 1 mg
-0°C **PROPYL)-N'-METHYL-** 2 mg
1,3-PROPANEDIAMINE
(Photobiotin)
Acetate Salt
Minimum 98%
Photoactive reagent for covalent modification wi biotin.



See also: Molecular Biology Products *Page 1644*
[96087-37-5] $C_{23}H_{35}N_9O_4S \cdot C_2H_4O_2$ FW 593.

(2S,3R,4E)-2-AZIDO- 1 mg
A 0456 **4-OCTADECENE-1,3-DIOL** 5 mg
-0°C (D-Sphingosine azide)
[103348-49-8] $C_{18}H_{35}N_3O_2$ FW 325.5

12-AZIDOOLEIC ACID 100 mg
A 8265 Photosensitive chemical for 500 mg
studies of phospholipid-protein interactions in biological membranes
Ref.: Chakrabarti, P. and Khorana, H.G., Biochemistry, **14**, 5021 (1975).
[57818-47-0] $C_{18}H_{33}N_3O_2$ FW 323.5

PRODUCT NUMBER | US $

2-BROMOACETOPHENONE 1 g 4.95
B 3145 (Phenacyl bromide) 5 g 15.65
-0°C 10 g 25.95
◆ Recrystallized, white to light yellow crystals.
Suitable for the derivatization and subsequent HPLC analysis of fatty acids.
Use-tested.
Ref.: 1. Wood, R. and Lee, T., J. Chromatogr., **254,** 237 (1983).
2. Mentasti, E., et al., J. Chromatogr., **322,** 177 (1985).
[70-11-1] C_8H_7BrO FW 199.0
R: 34 S: 26-27-36/37/39

BROMOACETYL-CELLULOSE
See under: Affinity Chromatography Media *Page 1925*

BROMOACETYL CHLORIDE 50 g 35.55
B 4510 **Approx. 95% (NMR)** 100 g 59.25
2-8°C May contain chloroacetyl chloride and bromoacetyl bromide.
◆ *[22118-09-8]* C_2H_2BrClO FW 157.4
R: 34-14 S: 26-27-36/37/39-3/7/9

1-BROMOADAMANTANE 25 g 18.90
B 2141 *[768-90-1]* $C_{10}H_{15}Br$ FW 215.1
RT

8-BROMOADENINE 100 mg 14.45
B 2502 (6-Amino-8-bromopurine) 500 mg 45.00
-0°C **Crystalline** 1 g 74.10
[6974-78-3] $C_5H_4N_5Br$
FW 214.0

8-BROMOADENOSINE 250 mg 12.60
B 6272 (6-Amino-8-bromopurine riboside) 1 g 31.80
-0°C White powder 5 g 125.60
[2946-39-6] $C_{10}H_{12}BrN_5O_4$
FW 346.1
R: 36/37/38 S: 26-36-22

8-BROMOADENOSINE 3′:5′-CYCLIC MONOPHOSPHATE
(8-Br-cAMP)
Membrane permeable cAMP analog; resistant to hydrolysis by phosphodiesterases

B 5386 **Free Acid** 5 mg 13.35
-0°C *[23583-48-4]* $C_{10}H_{11}BrN_5O_6P$ 25 mg 44.50
FW 408.1 100 mg 123.60
250 mg 296.65

B 7880 **Sodium Salt** 5 mg 13.60
-0°C **Approx. 98%** 25 mg 42.30
[76939-46-3] 100 mg 117.45
$C_{10}H_{10}BrN_5O_6PNa$ FW 430.1 250 mg 276.70

See also:
N^6,2′-O-Dibutyryladenosine 3′:5′-Cyclic Monophosphate *Page 375*
N^6-Monobutyryladenosine 3′:5′-Cyclic Monophosphate *Page 763*
2′-O-Monobutyryladenosine 3′:5′-Cyclic Monophosphate *Page 763*
2′-O-Monobutyryl-8-bromoadenosine 3′:5′-Cyclic Monophosphate *Page 763*
N^2-Monobutyrylguanosine 3′:5′-Cyclic Monophosphate *Page 763*
2′-O-Monobutyrylguanosine 3′:5′-Cyclic Monophosphate *Page 763*

8-BROMOADENOSINE 5′-DIPHOSPHATE 5 mg 53.35
B 3881 25 mg 192.50
-0°C **Sodium Salt**
Approx. 95%
[102185-47-7] $C_{10}H_{14}BrN_5O_{10}P_2$ FW 506.1 (for free acid)
R: 23/24/25-36/37/38 S: 45-26-36

PRODUCT NUMBER | US $

8-BROMOADENOSINE 5′-MONOPHOSPHATE 5 mg 14.65
B 3131 25 mg 46.40
-0°C **Free Acid**
Approx. 98%
[23567-96-6] $C_{10}H_{13}BrN_5O_7P$ FW 426.1

8-BROMOADENOSINE 5′-TRIPHOSPHATE 5 mg 12.30
B 3756 25 mg 35.35
-0°C (8-Br-ATP)
Sodium Salt
Approx. 95%
[81035-56-5] $C_{10}H_{15}N_5O_{13}P_3Br$ FW 586.1 (for free acid)
R: 23/24/25-36/37/38 S: 45-26-36-22

16α-BROMOANDROSTERONE 1 mg 33.65
B 4266 (5α-Androstan-16α-bromo-3α-ol-17-one) 5 mg 122.90
RT 10 mg 220.95
[59462-53-2] $C_{19}H_{29}BrO_2$
FW 369.3

16β-BROMOANDROSTERONE 5 mg 117.60
B 9392 (5α-Androstan-16β-bromo-3α-ol-17-one)
RT *[115115-49-6]* $C_{19}H_{29}BrO_2$ FW 369.3

o-BROMOANILINE 10 g 27.85
B 0755 (2-Bromoaniline)
2-8°C Yellow to brown solid
◆ *[615-36-1]* C_6H_6BrN FW 172.0
R: 20/21/22-36/37/38 S: 45-26-36/37/39-22

m-BROMOANILINE 25 ml 56.20
B 4007 (3-Bromoaniline) 100 ml 138.60
RT d = 1.58 g/ml
◆ *[591-19-5]* C_6H_6BrN FW 172.0
R: 20/21/22-36/37/38 S: 45-26-36/37/39-23

p-BROMOANILINE
(4-Bromoaniline)
[106-40-1] C_6H_6BrN FW 172.0
R: 20/21/22-36/37/38 S: 45-26-36/37/39-22

B 2395 **Approx. 98%** 10 g 17.80
RT White to light yellow crystals. 25 g 35.50
◆ 50 g 55.35
100 g 90.60

B 2752 **Practical Grade** 100 g 24.25
RT Tan powder, may produce turbid
◆ solutions.

3-BROMOBENZALDEHYDE 100 g 62.65
B 7261 *[3132-99-8]* C_7H_5BrO FW 185.0
2-8°C R: 36/37/38 S: 26-36

4-BROMOBENZALDEHYDE 25 g 38.20
B 1139 *[1122-91-4]* C_7H_5BrO FW 185.0
RT R: 22-36/37/38 S: 26-36

BROMOBENZENE 100 ml 7.25
B 8006 d = 1.49 g/ml 500 ml 19.70
RT *See also:* Environmental Standards 1 liter 37.65
Page 2017
[108-86-1] C_6H_5Br FW 157.0
R: 10-38-51/53 S: 61

BROMOBENZENE-d_5 5 g 34.15
B 2632 **99+ atom % D**
RT *[4165-57-5]* C_6D_5Br FW 162.0
R: 10-38 S: 24

p-BROMOBENZENESULFONYL CHLORIDE 25 g 28.40
B 1134
RT **Crystalline**
◆ *[98-58-8]* $C_6H_4BrClO_2S$ FW 255.5
R: 34 S: 26-27-36/37/39

o-BROMOBENZOIC ACID 25 g 13.55
B 6381 (2-Bromobenzoic acid)
-0°C **Crystalline**
[88-65-3] $C_7H_5BrO_2$ FW 201.0
R: 36/37/38 S: 26-36

PRODUCT NUMBER

m-BROMOBENZOIC ACID 5 g 1
B 2884 (3-Bromobenzoic Acid)
-0°C **Crystalline**
[585-76-2] $C_7H_5BrO_2$ FW 201.0
R: 36/37/38 S: 26-36

p-BROMOBENZOIC ACID 10 g 1
B 2634 (4-Bromobenzoic Acid)
-0°C **Crystalline**
[586-76-5] $C_7H_5BrO_2$ FW 201.0
R: 22-36/37/38 S: 26-36

N-(2-BROMOBENZYL)-N-2-(CHLOROETHYL)-ETHYLAMINE
See: N-(2-Chloroethyl)-N-ethyl-2-bromobenzylamin
Page 269

BROMOBIMANE 25 mg 4
B 4380 **Minimum 97%**
-0°C Fluorescent probe for thiols
Ref.: 1. Kosower, N.S., et al., Proc. Natl. Acad. S USA, **76,** 3382 (1979).
2. Danielsohn, P. and Nolte, A., Histochem., **86,** (1987).
[71418-44-5] $C_{10}H_{11}N_2O_2Br$ FW 271.1

4-BROMO-2-BUTENOIC ACID METHYL ESTER 5 ml 3
B 3152 **Approx. 97% (GC)**
2-8°C d = 1.51 g/ml
◆ Stabilized with silver wool.
[1117-71-1] $C_5H_7O_2Br$ FW 179.0
R: 34-42/43 S: 26-27-36/37/39

3-BROMO-3-BUTEN-1-OL 1 g
41,088-8 **Minimum 98% (GC)** 10 g 1
2-8°C *[76334-36-6]* C_4H_7BrO
FW 151.0
R: 36/37/38 S: 26-36

N-(4-BROMOBUTYL)PHTHALIMIDE 10 g
B 3502 **Approx. 95%**
2-8°C **Crystalline**
[5394-18-3] $C_{12}H_{12}BrNO_2$ FW 282.1
R: 36/37/38 S: 26-36

2-BROMOBUTYRIC ACID 100 ml
B 0136 d = 1.56 g/ml
2-8°C *[80-58-0]* $C_4H_7BrO_2$ FW 167.0
◆ R: 23/24/25-34 S: 26-45-27-36/37/39

4-BROMOBUTYRIC ACID 5 g
B 3627 **Approx. 98%** 10 g
2-8°C Yellow to brown semi-solid. 50 g
◆ *[2623-87-2]* $C_4H_7BrO_2$ FW 167.0
R: 34 S: 26-27-36/37/39

4-BROMOBUTYRIC ACID ETHYL ESTER 25 ml
B 3652 **Minimum 97% (GC)**
RT d = 1.35 g/ml
[2969-81-5] $C_6H_{11}O_2Br$ FW 195.1
R: 36/37/38 S: 26-36

4-BROMO-CALCIUM IONOPHORE 1 mg
B 7272 **A23187** 5 mg 3
2-8°C **Free Acid**
Ref.: Debone, M., et al., Biochemistry, **20,** 686 (1981).
[76455-82-8] $C_{29}H_{36}BrN_3O_6$ FW 602.5
R: 20/21/22-36/37/38 S: 26-36/37/39

([1R]-endo)-(+)-3-BROMOCAMPHOR 10 g
B 6884 (3-Bromo-d-camphor) 50 g
2-8°C *[10293-06-8]* $C_{10}H_{15}BrO$ 100 g
FW 231.1
R: 36/37/38 S: 26-36

([1S]-endo)-(−)-3-BROMOCAMPHOR 5 g
B 1396 *[64474-54-0]* $C_{10}H_{15}BrO$ FW 231.1
RT R: 36/37/38 S: 26-36

PRODUCT NUMBER | US $

BROMOCHLOROMETHANE
B 0639 d = 1.99 g/ml — 100 g 12.55
See also: Environmental Standards *Page 2015* and *Page 2017*
[74-97-5] CH_2BrCl FW 129.4
R: 20-41-37/38 S: 26-36-23

1-BROMO-3-CHLOROPROPANE
See: Molecular Biology Reagents *Page 1599*

2-BROMO-1-CHLOROPROPANE
See: Environmental Standards *Page 2015* and *Page 2018*

2-BROMO-2-CHLORO-1,1,1-TRIFLUOROETHANE
B 4388 (Halothane) — 5 g 16.15; 50 g 16.85; 250 g 54.25
Minimum 99%
Inhalation anesthetic
d = 1.88 g/ml
Stabilized with 0.01% thymol.
[151-67-7] $C_2HBrClF_3$ FW 197.4
R: 20-41-40 S: 26-36-23

3β-BROMO-5-CHOLESTENE
See: Cholesteryl Bromide *Page 283*

BROMOCONDURITOL
See: 6-Bromo-4-cyclohexene-1,2,3-triol *Page 209*

BROMOCRESOL GREEN
See: Bromcresol Green *Page 204*

BROMOCRYPTINE MESYLATE
See: 2-Bromo-α-ergocryptine Methanesulfonate *Page 210*

8-BROMO-CYCLIC ADENOSINE DIPHOSPHATE RIBOSE
B 5416 (Br-cADP-ribose) — 250 µg 41.65; 500 µg 79.05
90-95% (HPLC)
Prepared enzymatically
Lyophilized powder containing 10-20% sodium phosphate buffer salts.
Antagonist of cADP-ribose-induced Ca^{2+} release.[1]
Ref.: 1. Biochim. Biophys. Acta, **1178,** 235 (1993).
See also: Cyclic Adenosine Diphosphate-Ribose *Page 332*
[151898-26-9] $C_{15}H_{20}BrN_5O_{13}P_2$ FW 620.2
R: 36/37/38 S: 26-36

6-BROMO-4-CYCLOHEXENE-1,2,3-TRIOL
B 1147 (Bromoconduritol) — 1 mg 8.85; 5 mg 29.25; 10 mg 48.70
Mixed Isomers
Glucosidase inhibitor
Ref.: 1. Meth. Enz. **138, Part E,** 693 (1987).
2. Datema, R. et al., Proc. Natl. Acad. Sci. USA, **79,** 6787 (1982).
[42014-74-4] $C_6H_9BrO_3$ FW 209.0

5-BROMOCYTIDINE
B 5132 — 100 mg 23.25
[3066-86-2] $C_9H_{12}BrN_3O_5$
FW 322.1

5-BROMOCYTOSINE
B 4752 — 250 mg 19.05
[2240-25-7] $C_4H_4BrN_3O$
FW 190.0

10-BROMODECAN-1-OL
B 5266 **Approx. 95%** — 1 g 19.25; 10 g 130.30
d = 1.09 g/ml
[53463-68-6] $C_{10}H_{21}BrO$ FW 237.2
R: 36/37/38 S: 26-36

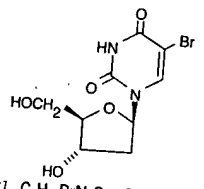
5-BROMO-2′-DEOXYCYTIDINE
B 5756 — 100 mg 14.65; 500 mg 46.15; 1 g 76.25
[1022-79-3] $C_9H_{12}BrN_3O_4$
FW 306.1
R: 40 S: 22-36

PRODUCT NUMBER | US $

5-BROMO-2′-DEOXYCYTIDINE 5′-MONOPHOSPHATE Sodium Salt
B 2381 **Approx. 98%** — 25 mg 92.60
[88188-03-8] $C_9H_{13}BrN_3O_7P$ FW 386.1 (for free acid)

5-BROMO-2′-DEOXYCYTIDINE 5′-TRIPHOSPHATE Sodium Salt
B 1886 **Approx. 95%** — 1 mg 19.75; 5 mg 64.15; 10 mg 106.85
[30419-11-5] $C_9H_{15}BrN_3O_{13}P_3$ FW 546.1 (for free acid)
R: 36/37/38 S: 26-36

5-BROMO-2′-DEOXYURIDINE
(BUdR; Br-dU)
Thymidine analog used as a mutagen in genetic research.



[59-14-3] $C_9H_{11}BrN_2O_5$ FW 307.1
R: 46-61-20/21/22 S: 45-36/37/39

B 9285 **SigmaUltra** — 50 mg 9.50; 250 mg 31.70; 1 g 87.80
Minimum 99%
Residue after ignition: <0.1%
Solubility (0.1 M in NH_4OH, 20°C): complete, colorless
Insoluble matter: <0.1%
Al: <0.0005%
Ca: <0.001%
Cu: <0.0005%
Fe: <0.0005%
K: <0.005%
Mg: <0.0005%
Na: <0.005%
NH_4^+: <0.05%
P: <0.005%
Pb: <0.001%
Zn: <0.0005%

B 5002 **Minimum 99%** — 100 mg 10.65; 250 mg 16.15; 500 mg 26.85; 1 g 44.75; 5 g 167.95

5-BROMO-2′-DEOXYURIDINE-2-^{14}C
See: Radiochemicals Section *Page 2124*

5-BROMO-2′-DEOXYURIDINE, MONOCLONAL ANTIBODY TO
(Anti-BrdU)
See: Immunochemicals *Page 1280*

5-BROMO-2′-DEOXYURIDINE 5′-MONOPHOSPHATE Sodium Salt
B 2506 — 5 mg 59.15; 10 mg 97.90; 25 mg 194.75
[51432-32-7] $C_9H_{12}BrN_2O_8P$
FW 387.1 (for free acid)
R: 40 S: 36-22

5-BROMO-2′-DEOXYURIDINE 5′-TRIPHOSPHATE Sodium Salt
B 0631 **Approx. 90%** — 1 mg 19.75; 5 mg 64.15; 10 mg 106.85; 25 mg 212.75
[102212-99-7] $C_9H_{14}BrN_2O_{14}P_3$
FW 547.0 (for free acid)
R: 23/24/25-36/37/38-40 S: 45-26-36-22

BROMODICHLOROMETHANE
See: Environmental Standards *Page 2015* and *Page 2018*

PRODUCT NUMBER			US $
D 9670	**3-DEOXY-D-GLYCERO-D-GALACTO-2-NONULOSONIC ACID (KDN)** -0°C	10 mg	46.65
		50 mg	184.90

Ammonium Salt
A natural deaminated sialic acid utilized for identification and quantification of nonulosonic acid residues in poly(oligo)nonulosonates.
Ref.: 1. Nadano, D., et al., J. Biol. Chem., **261**, 11550 (1986).
2. Kitajima, K., et al., Anal. Biochem., **205**, 244 (1992).
[112543-66-5] $C_9H_{16}O_9 \cdot NH_3$ FW 285.3

D 7145	**2'-DEOXYGUANOSINE 99-100%** RT	25 mg	11.60
		100 mg	32.15
		250 mg	64.15
		1 g	177.95
		5 g	592.80

See also: Tissue Culture Media and Reagents *Page 1758*
[961-07-9] $C_{10}H_{13}N_5O_4$
FW 267.2

2'-DEOXYGUANOSINE-8-^{14}C
See: Radiochemicals Section *Page 2127*

D 7285	**3'-DEOXYGUANOSINE** RT	5 mg	36.25
	[3608-58-0] $C_{10}H_{13}N_5O_4$	10 mg	60.30
	FW 267.2	50 mg	200.15

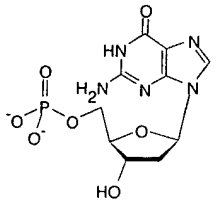
D 9250	**2'-DEOXYGUANOSINE 5'-DI-PHOSPHATE Sodium Salt Approx. 97%** -0°C	25 mg	57.75
		100 mg	187.40

[102783-74-4] $C_{10}H_{15}N_5O_{10}P_2$ FW 427.2 (for free acid)
R: 36/37/38 S: 26-36

2'-DEOXYGUANOSINE 3'-MONOPHOSPHATE

D 4147	**Ammonium Salt Approx. 98%** -0°C	5 mg	48.50
		25 mg	161.45
	[102783-49-3] $C_{10}H_{14}N_5O_7P$	100 mg	530.15
	FW 347.2 (for free acid)		
D 3264	**Sodium Salt Approx. 98%** -0°C	5 mg	48.50
		25 mg	161.45
	[102814-03-9] $C_{10}H_{14}N_5O_7P$	100 mg	530.15
	FW 347.2 (for free acid)		
	R: 36/37/38 S: 26-36		

2'-DEOXYGUANOSINE 5'-MONOPHOSPHATE
(5'-Deoxyguanylic acid; d-GMP)



D 9625	**Free Acid 98-100%** -0°C	100 mg	12.10
		500 mg	41.20
	[902-04-5] $C_{10}H_{14}N_5O_7P$	1 g	66.55
	FW 347.2		
D 9500	**Sodium Salt 98-100%** -0°C	100 mg	8.50
		250 mg	13.65
	Also available as part of a kit.	500 mg	24.75
	See: Standards and Controls Section *Page 2148*	1 g	44.05
	[52558-16-4] $C_{10}H_{14}N_5O_7P$ FW 347.2 (for free acid)		
	R: 36/37/38 S: 26-36		

PRODUCT NUMBER			US $
D 1381	**2'-DEOXYGUANOSINE 5'-MONOPHOSPHO-MORPHOLIDATE 4-Morpholine-N,N'-dicyclohexylcarboxamidine salt** -0°C	100 mg	36.20
		1 g	200.55

[102783-39-1] $C_{14}H_{21}N_6O_7P \cdot C_{17}H_{31}N_3O$
FW 709.8
S: 7-22

D 4010	**2'-DEOXYGUANOSINE 5'-TRI-PHOSPHATE Sodium Salt Approx. 97%** -0°C ◆	10 mg	24.75
		25 mg	49.20
		100 mg	142.15
		1 g	1015.40
	[93919-41-6] $C_{10}H_{16}N_5O_{13}P_3$	Shipped in dry ice	
	FW 507.2 (for free acid)		
	R: 36/37/38 S: 26-36-22		

DEOXYGUANYLIC ACID (5')
See: 2'-Deoxyguanosine 5'-Monophosphate *Page 356*

D 0770	**2'-DEOXYGUANYLYL(3'→5')-2'-DEOXYGUANOSINE Sodium Salt Minimum 98%** -0°C	1 mg	52.15
		4 mg	173.70

[113753-10-9] $C_{20}H_{24}N_{10}O_{10}PNa$ FW 618.4

D 7514	**2-DEOXY-D-ribo-HEXOPYRANOSE** RT	25 mg	10.95
	[20789-85-9] $C_6H_{12}O_5$	100 mg	28.40
	FW 164.2	500 mg	101.60

11-DEOXY-17-HYDROXYCORTICOSTERONE
See: Reichstein's Substance S *Page 970*

D 6043	**2-DEOXY-20-HYDROXY-ECDYSONE** 2-8°C	500 µg	40.65
		1 mg	72.30

(3β,14,20,22[R],25-Pentahydroxy-5β-cholest-7-en-6-one)
Minimum 80%
[17942-08-4] $C_{27}H_{44}O_6$ FW 464.6

D 5287	**2'-DEOXYINOSINE Minimum 98%** -0°C	100 mg	9.25
		250 mg	15.30
	Essentially free of inosine.	500 mg	25.40
	[890-38-0] $C_{10}H_{12}N_4O_4$	1 g	46.95
	FW 252.2	5 g	193.95

D 0126	**2'-DEOXYINOSINE 5'-MONOPHOSPHATE Sodium Salt Synthetic** -0°C	5 mg	7.65
		100 mg	30.75
		250 mg	61.35
		1 g	170.35

[14999-52-1] $C_{10}H_{13}N_4O_7P$
FW 332.2 (for free acid)
R: 36/37/38 S: 26-36

D 0758	**2'-DEOXYINOSINE 5'-TRIPHOSPHATE Sodium Salt Synthetic: 95-97%** -0°C ◆	5 mg	14.90
		25 mg	48.15
		Shipped in dry ice	
	[95648-77-4] $C_{10}H_{15}N_4O_{13}P_3$ FW 492.2 (for free acid)		
	R: 36/37/38 S: 26-36		

5'-DEOXY-5'-S-ISOBUTYLTHIOADENOSINE
See: 5'-S-Isobutyl-5'-Deoxyadenosine *Page 642*

D 9160	**1-DEOXYMANNOJIRIMYCIN (1,5-Dideoxy-1,5-imino-D-mannitol) Hydrochloride** 2-8°C	1 mg	25.45
		5 mg	78.75
		10 mg	141.95

[84444-90-6] $C_6H_{13}NO_4 \cdot HCl$
FW 199.6
R: 20/21/22 S: 36

6-DEOXY-L-MANNOSE
See: L-Rhamnose *Page 973*

2'-DEOXY-N^6-METHYLADENOSINE
See: N^6-Methyl-2'-deoxyadenosine *Page 737*

D 5011	**5'-DEOXY-5'-METHYL-THIOADENOSINE** -0°C	25 mg	19.45
		100 mg	52.50
	[2457-80-9] $C_{11}H_{15}N_5O_3S$	250 mg	104.20
	FW 297.3	1 g	271.30
	R: 36/37/38 S: 26-36		

PRODUCT NUMBER			US $
D 6149	**1-DEOXY-1-MORPHOLINO-D-FRUCTOSE** -0°C	10 mg	46.65
		50 mg	184.90

[6291-16-3] $C_{10}H_{19}NO_6$
FW 249.3

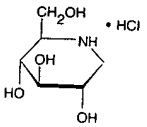
D 3651	**1-DEOXY-1-NITRO-D-MANNITOL** RT	25 mg	11.60
	[14199-83-8] $C_6H_{13}NO_7$	100 mg	32.15
	FW 211.2	250 mg	64.15
		1 g	177.95
		5 g	592.80

D 3526	**1-DEOXY-1-NITRO-D-SORBITOL** RT	25 mg	11.60
	[14199-88-3] $C_6H_{13}NO_7$	100 mg	32.15
	FW 211.2	250 mg	64.15
		1 g	177.95
		5 g	592.80

D 0156	**DEOXYNIVALENOL** 2-8°C ◆	1 mg	52.15
		4 mg	173.70

(Vomitoxin; 3α,7α,15-Trihydroxy-12,13-epoxytrichothec-9-en-8-one)
WARNING: Extremely hazardous! B risks and familiar with safety proce use this product.
Also available as part of a kit. *See: P*
[51481-10-8] $C_{15}H_{20}O_6$ FW 296.
R: 26/27/28-36/37/38 S: 45-36

1-DEOXYNOJIRIMYCIN
D 9305 Hydrochloride 2-8°C
A competitive inhibitor of glucosidase I and II[1,2]. Recently found to inhibit pig kidney trehalase
Ref.: 1. Neverova, I., et al., Anal. Bi 190 (1994).
2. Yamashita, Y., et al., J. Virol., **68**
3. Kyosseva, S.V., et al., Arch. Bioc **316**, 821 (1995).



[73285-50-4] $C_6H_{13}NO_4 \cdot HCl$ FW
R: 36/38 S: 26-36

2'-DEOXYNUCLEOSIDES and 2'-DEO 5'-NUCLEOTIDES, Kits of
See: Standards and Controls Section

3-DEOXYOCTULOSONIC ACID
See: 2-Keto-3-deoxyoctonate *Page 6*

D-erythro-DEOXYPENTOSE
See: Deoxy-D-ribose *Page 359*

D 0376	**2-DEOXY-6-PHOSPHOGLUCONIC ACID Sodium Salt Approx. 95%** -0°C	10 mg	46.65
		50 mg	184.90

[102783-23-3]

D 2681	**2-DEOXY-2-PHTHALIMIDO-3,4,6-TRI-O-ACETYL-α-D-GALACTOPYRANOSYL FLUORIDE** RT	10 mg	1(
		50 mg	5(

Contains up to 10% β-anomer
[177966-56-2] $C_{20}H_{20}NO_9F$ FW 437
R: 36/37/38 S: 26-36

D 2806	**2-DEOXY-2-PHTHALIMIDO-3,4,6-TRI-O-ACETYL-α-D-GLUCOPYRANOSYL FLUORIDE** RT	10 mg	1(
		50 mg	5(

May contain up to 10% β-anomer
[147157-97-9] $C_{20}H_{20}NO_9F$ FW 437.
R: 36/37/38 S: 26-36

D 0501	**4-DEOXYPYRIDOXINE Hydrochloride** -0°C 2-8°C	25 mg	5(
		100 mg	15(

Vitamin B_6 antagonist
[148-51-6] $C_8H_{11}NO_2 \cdot HCl$ FW 189.

PRODUCT NUMBER | US $

FITC-PEROXIDASE
See: Peroxidase - Fluorescein Isothiocyanate labeled *Page 849*

FITC - PROTEIN A
See: Protein A- FITC listed under Protein A - Soluble *Page 947*

FIXATIVE SOLUTION
See:
Ethanol Fixative *Page 452*
Formalin Solution, Neutral Buffered *Page 492*

FIXING SOLUTION 500 ml 66.35
F 7264 **5× Concentrate** 1 liter 119.40
RT
◆
60% (w/v) trichloroacetic acid,
17.5% (w/v) 5-sulfosalicylic acid.
The working solution is useful for fixing proteins in polyacrylamide and agarose gels prior to staining. Suitable for PAGE, SDS-PAGE, and IEF systems.
R: 34-45 S: 45-27-36/37/39-23

FK-BINDING PROTEIN 100 µg 106.70
F 5398 **Human, Recombinant**
2-8°C
Expressed in E. coli
Enzyme which catalyzes cis-trans isomerization of X-Pro peptide bonds[1] (i.e., a peptidyl prolyl isomerase) in synthetic substrates.
FK binding protein characterized by binding to, and inhibition by, the immunosuppressant, FK-506.[2]
Ref.: 1. Fischer, G., et al., Biomed. Biochim. Acta, **43,** 1101 (1984).
2. Handschumacher, R.E., et al., Science, **226,** 544 (1984).
[131144-19-9]

FLAGYL
A trademark for a product containing Metronidazole (M 3761) *Page 758*

FLASHLIGHTS
See: Techware Section *Page 2404*

FLAVAZIN L 50 g 20.90
F 8879 (C.I. 18820; Acid Yellow 11)
RT
Dye content: Approx. 50%
[6359-82-6] $C_{16}H_{13}N_4O_4SNa$ FW 380.4

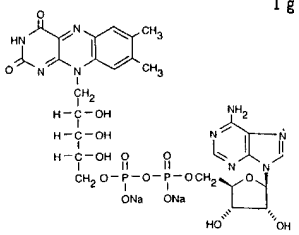
FLAVIANIC ACID
(2,4-Dinitro-1-naphthol-7-sulfonic acid)

F 6500 **Free Acid** 25 g 27.00
RT
◆
[483-84-1] $C_{10}H_6N_2O_8S$ FW 314.2
R: 34-40 S: 26-36/37/39-22

F 7754 (C.I. 10316; Acid Yellow 1; 25 g 9.05
RT
Naphthol Yellow S) 100 g 25.10
Disodium Salt
Dye content: Approx. 60%
[846-70-8] $C_{10}H_4N_2O_8SNa_2$ FW 358.2

PRODUCT NUMBER | US $

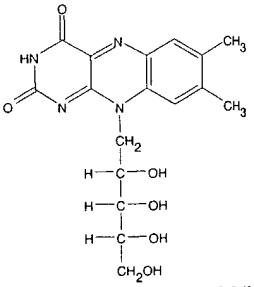
FLAVIN ADENINE DINUCLEOTIDE 10 mg 8.15
F 6625 (FAD) 25 mg 11.35
-0°C
Disodium Salt 100 mg 27.05
Minimum 94% 250 mg 54.10
Orange powder. 500 mg 80.35
1 g 144.80



Also available as part of a kit.
See: Standards and Controls Section *Page 2148*
See also: Tissue Culture Media and Reagents *Page 1759*
[146-14-5] $C_{27}H_{31}N_9O_{15}P_2Na_2$ FW 829.5

FLAVIN ADENINE DINUCLEOTIDE-AGAROSE
See: Affinity Chromatography Media *Page 1950*

FLAVIN MONONUCLEOTIDE
(FMN; Riboflavin 5′-phosphate)



[130-40-5] $C_{17}H_{21}N_4O_9P$ FW 456.3 (for free acid)

F 8399 **Sodium Salt** 1 mg 24.15
-0°C
Approx. 95% (HPLC) 5 mg 80.30
Prepared by the enzymatic hydrolysis of flavin adenine dinucleotide. 10 mg 133.80

F 2253 **Sodium Salt; Synthetic** 10 mg 13.10
-0°C
Approx. 80% (HPLC) 25 mg 25.40
Riboflavin Content: Less than 0.3% 100 mg 63.00
A further purification of F 6750 to reduce riboflavin. Biologically active in the growth of L. casei (ATCC Strain 7469).
Also available as part of a kit.
See: Standards and Controls Section *Page 2148*
See also: Tissue Culture Media and Reagents *Page 1759*

F 6750 **Sodium Salt** 5 g 10.85
-0°C
Riboflavin Content: 73.0-79.0% 10 g 17.00
Free Riboflavin: ≤6.0% 25 g 27.30
Riboflavin Diphosphates: ≤6.0% (as riboflavin) 100 g 86.85
Non-profit institutions may request one 5-gram package GRATIS as often as necessary. Only one gratis package per order.

FLAVIN MONONUCLEOTIDE, Electrophoresis Reagent
See: Electrophoresis Reagents *Page 1970*

FLAVIN MONONUCLEOTIDE-AGAROSE
See under: Affinity Chromatography Media *Page 1950*

PRODUCT NUMBER

FLAVONE
F 2003 (2-Phenyl-4H-1-benzopyr
RT
Crystalline
[525-82-6] $C_{15}H_{10}O_2$ F
R: 36/37/38 S: 26-36

FLAVORIDIN
See: Tissue Culture Medi

FLAZO ORANGE
F 2007 (1-[5-Chloro-2-hydroxyphe
2-8°C
2-naphthol)
Approx. 98%
[3566-94-7] $C_{16}H_{11}ClN_2($

FLECAINIDE
F 6777 (N-[2-Piperidylmethyl]-2,5-
3-4°C
[2,2,2-trifluoroethoxy]ben
Acetate Salt
Class I antiarrythmic agent
Ref.: 1. Roden, D.M. and
Med., **315,** 36 (1986).
2. Somani, P., Clin. Pharm
(1980).
[54143-56-5] $C_{17}H_{20}F_6N_2($
R: 23/24/25-36/37/38-4(

FLORISIL
(Magnesium silicate, activa
The PR grade is suitable fo
analysis.

F 9760 **Mesh: 16-30**
RT
Act. Temp. 1,250°F.
[1343-88-0]
R: 36/37/38 S: 26-36

F 5754 **Mesh: 30-60**
RT
Act. Temp. 1,200°F.
[1343-88-0]
R: 36/37/38 S: 26-36

F 9127 **Mesh: 60-100/PR**
RT
Act. Temp. 1,250°F.
[1343-88-0]
R: 36/37/38 S: 26-36

F 6875 **Mesh: 60-100**
RT
Act. Temp. 1,200°F.
[1343-88-0]
R: 36/37/38 S: 26-36

F 7752 **Mesh: 100-200**
RT
Act. Temp. 1,200°F.
[1343-88-0]
R: 36/37/38 S: 36

F 9635 **Mesh: −200**
RT
Act. Temp. 1,200°F.
[1343-88-0]
R: 36/37/38 S: 26-36

F 9885 **TLC Grade**
RT
[1343-88-0]
R: 36/37/38 S: 26-36

FLOW CYTOMETRY COMPENS
See: Immunochemicals *Page 1*

FLUDARABINE des-PHOSPHATI
See: 2-Fluoroadenine 9-β-D-Aral
Page 483

FLUDROCORTISONE
F 2693 (6α-Fluoro-11β,17α,21-trihydro
4-pregnene-3,20-dione;
9α-Fluorohydrocortisone;
9α-fluorocortisol; 4-Pregnene-9α
triol-3,20-dione)
Approx. 98%
[127-31-1] $C_{21}H_{29}FO_5$ FW 38(
R: 63 S: 26-36-22

PRODUCT NUMBER | US $

INHIBIN 1 vial 172.35

I 9149 -0°C **From Porcine Ovaries**
Follicle-stimulating hormone-suppressing protein
2,000 I.U. per vial
Bioassay not run by Sigma.
[57285-09-3]
R: 60 S: 45-36/37/39

INHIBIN-LIKE PEPTIDE
See: Bioactive Peptides *Page 1218*

INOCULATING LOOP/NEEDLE
See: Techware Section *Page 2325*

INORGANIC PYROPHOSPHATASE
(Pyrophosphate phosphohydrolase; EC 3.6.1.1)
Unit Definition: One unit will liberate 1.0 µmole of inorganic orthophosphate per min at pH 7.2 at 25°C, unless otherwise indicated.
[9024-82-2]

I 1891 -0°C **From Bakers Yeast** 1 vial 38.35
HPLC purified, lyophilized
Activity: 500-1,500 units per mg protein (BCA).
Prepared from I 1643; essentially salt-free
Minimum 90% (reversed phase HPLC)
Vial contains 100 µg protein.

I 1643 -0°C **From Bakers Yeast** 100 units 22.70
Lyophilized powder 500 units 65.10
containing 85% buffer salts. 1,000 units 119.90
Activity: 500-1,000 units per mg protein ($E^{1\%}_{280}$).

I 2267 2-8°C **From E. coli** 100 units 21.70
Minimum 60% (SDS-PAGE) 500 units 62.25
Lyophilized powder containing Tris buffer salts.
Activity: Minimum 1,000 units per mg protein ($E^{1\%}_{278}$) at pH 9.0 at 25°C.

I 2891 2-8°C **Thermostable Enzyme** 50 units 25.90
from Bacillus 250 units 102.25
stearothermophilus 1,000 units 306.80
Lyophilized
Activity: 15-25 units per mg protein (Biuret) at pH 9.0 at 50°C.

INORGANIC PYROPHOSPHATES
See: Pyrophosphates *Page 875*

INOSINE
(Hypoxanthine 9-D-ribofuranoside)
We also offer: 2′,3′-O-Isopropylideneinosine *Page 647*
[58-63-9] $C_{10}H_{12}N_4O_5$ FW 268.2

I 1024 RT **SigmaUltra** 25 g 58.80
Minimum 99% 100 g 214.00
Residue upon ignition: <0.1%
Solubility (0.5 M in water, 20°C): complete, colorless
Insoluble matter: <0.2%

Cl: <0.05%	Mg: <0.0005%
SO_4: <0.05%	Na: <0.005%
Al: <0.0005%	NH_4^+: <0.05%
Ca: <0.0005%	P: <0.0005%
Cu: <0.0005%	Pb: <0.001%
Fe: <0.0005%	Zn: <0.0005%
K: <0.005%	

I 4125 RT **Minimum 99%** 1 g 6.45
5 g 11.05
10 g 18.35
25 g 29.40
100 g 107.00

INOSINE-8-^{14}C
See: Radiochemicals Section *Page 2133*

PRODUCT NUMBER | US $

INOSINE 3′:5′-CYCLIC MONOPHOSPHATE
I 2753 -0°C **Sodium Salt** 10 mg 20.25
Approx. 98% 50 mg 67.30
For other Cyclic Nucleotides *See: Page 333* 1 g 622.15
[41092-64-2] $C_{10}H_{10}N_4O_7PNa$ FW 352.2

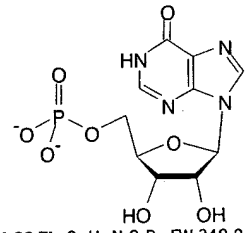
INOSINE 5′-DIPHOSPHATE (IDP)
I 4375 -0°C **Sodium Salt** 25 mg 10.90
Approx. 97% 100 mg 26.10
Prepared from muscle or bacterial ADP. 500 mg 113.05
[81012-88-6] $C_{10}H_{14}N_4O_{11}P_2$ FW 428.2 (for free acid) 1 g 203.75
R: 20/22-36/37/38 S: 45-22-36

INOSINE, 2′,3′-ISOPROPYLIDENE Derivative
See: 2′,3′-O-Isopropylideneinosine *Page 647*

INOSINE 3′-MONOPHOSPHATE
I 7628 -0°C **Sodium Salt** 1 mg 9.90
Approx. 99% 10 mg 50.65
Crystalline
[97259-68-2] $C_{10}H_{13}N_4O_8P$ FW 348.2

INOSINE 5′-MONOPHOSPHATE
(Inosinic Acid; IMP; I-5′-P)

I 2879 -0°C **Free Acid** 500 mg 8.85
Grade V: 98-100% 1 g 14.45
From Yeast 5 g 51.00



[131-99-7] $C_{10}H_{13}N_4O_8P$ FW 348.2

I 4625 2-8°C **Disodium Salt** 1 g 6.40
Grade III: 98-100% 5 g 13.25
From Yeast 10 g 22.15
Crystalline 25 g 38.10
[4691-65-0] $C_{10}H_{11}N_4O_8PNa_2$ 100 g 134.65
FW 392.2

I 4500 2-8°C **Sodium Salt** 100 mg 11.35
Sigma Grade: 99-100% 500 mg 48.20
From Muscle 1 g 79.30
Crystalline
[4691-65-0] $C_{10}H_{13}N_4O_8P$ FW 348.2 (for free acid)
R: 23/24/25-36/37/38 S: 26-36-22

INOSINE MONOPHOSPHATE, CYCLIC
See: Inosine 3′:5′-Cyclic Monophosphate *Page 628*

INOSINE 5′-MONOPHOSPHATE,
I 5009 -0°C **Periodate Oxidized** 25 mg 36.10
(Inosine 5′-monophosphate-2′,3′-dialdehyde)
Sodium Salt: Minimum 80%
Balance inorganic salts
[112898-40-5] $C_{10}H_{11}N_4O_8P$ FW 346.2 (for free acid)

INOSINE PHOSPHATES
See: Inosine Mono, Di, or Tri-phosphate

INOSINE 5′-TRIPHOSPHATE
I 0879 -0°C (ITP) 50 mg 6.15
Trisodium Salt 100 mg 10.15
95-97% 500 mg 33.55
◆ **Prepared from Bacterial ATP** 1 g 60.40
Shipped in dry ice
[35908-31-7] $C_{10}H_{12}N_4O_{14}P_3Na_3$
FW 574.1
R: 36/37/38 S: 26-36

PRODUCT NUMBER

INOSINE 5′-TRIPHOSP
I 5384 -0°C **Periodate Oxidized**
(Inosine 5′-triphospha
Sodium Salt: Minim
[105208-87-5] C_{10}H
acid)

INOSINIC ACID
See: Inosine 5′-Monop

epi-INOSITOL
I 1257 RT (1,2,3,4,5/6-Hexahyd
hexane)
Approx. 95%
[488-58-4] $C_6H_{12}O_6$

myo-INOSITOL
I 5125 RT (1,2,3,5/4,6-Hexahyd
hexane; meso-Inositol
Minimum 99%
See also: Tissue Cultu
Reagents *Page 1761*
[87-89-8] $C_6H_{12}O_6$ I

myo-INOSITOL-[2-^{3}H]
See: Radiochemicals S

scyllo-INOSITOL
I 8132 RT (DTLET; 1,3,5/2,4,6-I
hydroxycyclohexane)
[488-59-5] $C_6H_{12}O_6$

myo-INOSITOL, 2,2′-AI
I 0760 -0°C **2-C-HYDROXYMETH**
(2-C-Methylene-myo-in
Approx. 99%
Reported to be a com
inositol.
Ref.: Posternak, T., "
Francisco, Ca. (1965).
[4068-87-5] $C_7H_{12}O_6$

D-myo-INOSITOL 1,4-bi
I 0510 -0°C **PHATE**
Potassium Salt
Approx. 98% (TLC)
From Bovine Brain L-
4-Monophosphate
Ref.: Emilsson, A. and
259, 3111 (1984).
[103476-30-8] C_6H_{14}
acid)

D-myo-INOSITOL 2,4-bi
I 3139 -0°C **PHOSPHATE**
Ammonium Salt
Not assayed by Sigma.
[106358-02-5] C_6H_{14}

D-myo-INOSITOL 4,5-bi
I 3264 -0°C **PHOSPHATE**
Ammonium Salt
Not assayed by Sigma.
[69256-54-8] $C_6H_{14}O$

(−)-myo-INOSITOL 5,6-
I 8391 -0°C **PHOSPHATE**
Cyclohexylammoniur
Not assayed by Sigma
[142507-73-1] C_6H_{18}
acid)

DL-myo-INOSITOL 1,2-C
Cyclohexylammoniur
Approx. 98% (TLC)
[96038-12-9] $C_6H_{11}O_6$
R: 10-36/37/38 S: 1

I 1504 -0°C 1 mg per ml solution in
water (3:1).

PRODUCT NUMBER | US $

(Continuation of)
IODOACETIC ACID

I 4386 -0°C ◆ **Free Acid** — 10 g 12.85; 25 g 25.60; 100 g 85.75
Approx. 99%
Yellow powder.
May form hazy solution in water.
[64-69-7] $C_2H_3IO_2$ FW 185.9
R: 25-35 S: 22-36/37/39-45

I 1014 -0°C **Lithium Salt** — 5 g 22.70
Minimum 97% (titration)
[65749-30-6] $C_2H_2IO_2Li$ FW 191.9
R: 20/21/22-36/37/38 S: 26-36

I 9148 -0°C ◆ **Sodium Salt** — 5 g 28.90; 25 g 96.05
SigmaUltra
Approx. 99%
Solubility (0.5 M in water, 20°C): complete, colorless
Insoluble matter: <0.1%
SO_4: <0.05%
Al: <0.0005%
Ca: <0.0005%
Cu: <0.001%
Fe: <0.0005%
K: <0.02%
Mg: <0.0005%
NH_4^+: <0.05%
P: <0.0005%
Pb: <0.001%
Zn: <0.0005%
[305-53-3] $C_2H_2IO_2Na$ FW 207.9
R: 23/24/25 S: 45-26-36/37/39-22

I 2512 -0°C ◆ **Sodium Salt** — 25 g 45.75; 100 g 126.65
Approx. 99%
[305-53-3] $C_2H_2IO_2Na$ FW 207.9
R: 23/24/25 S: 45-26-36/37/39-22

IODOACETIC ACID N-HYDROXYSUCCINIMIDE ESTER — 10 mg 14.10; 50 mg 53.85; 100 mg 96.45
I 9760 -0°C
Reagent for cross-linking proteins.
Ref.: 1. J. Immun. Meth., **24**, 321 (1978).
2. Eur. J. Biochem., **140**, 63 (1984).
[39028-27-8] $C_6H_5INO_4$ FW 283.0
R: 36/37/38 S: 26-36

IODOACETIC ANHYDRIDE — 100 mg 12.90; 250 mg 25.80; 1 g 68.60
I 3507 2-8°C ◆ *[54907-61-8]* $C_4H_4I_2O_3$ FW 353.9
R: 34-23/24/25 S: 26-27-36/37/39

N-IODOACETYL-N′-(5-SULFO-1-NAPHTHYL)ETHYLENEDIAMINE — 100 mg 16.15; 1 g 89.40
I 8879 -0°C
(1,5-I-AEDANS)
Minimum 80% (HPLC)
Yellow crystals.
[36930-63-9] $C_{14}H_{15}IN_2O_4S$ FW 434.2

N-IODOACETYL-N′-(8-SULFO-1-NAPHTHYL)ETHYLENEDIAMINE — 25 mg 19.60
I 9004 RT
(1,8-I-AEDANS)
Yellow crystals.
[36930-64-0] $C_{14}H_{15}IN_2O_4S$ FW 434.2

19-IODO-5-ANDROSTENE-3β-OL-17-ONE 3-ACETATE — 5 mg 148.00
I 1757 2-8°C *[82341-96-6]* $C_{21}H_{29}IO_3$ FW 456.4

5-IODOANTHRANILIC ACID
See: 2-Amino-5-Iodobenzoic Acid *Page 111*

4-IODOANTIPYRENE-N-METHYL-^{14}C
See: Radiochemicals Section *Page 2133*

p-IODOBENZENESULFONYL CHLORIDE
See: Pipsyl Chloride *Page 903*

4-IODOBENZOIC ACID — 5 g 14.35
I 4759 RT *[619-58-9]* $C_7H_5IO_2$ FW 248.0
R: 36/37/38 S: 26-36

o-IODOBENZOIC ACID — 5 g 4.05; 25 g 11.80; 100 g 32.05; 250 g 70.55
I 7626 RT (2-Iodobenzoic acid)
Light yellow crystals.
[88-67-5] $C_7H_5IO_2$ FW 248.0
R: 20/21/22-42/43-40 S: 26-36-22

o-IODOBENZOTRIFLUORIDE — 1 g 4.40; 5 g 8.50; 25 g 24.50
I 6500 2-8°C ◆ (2-(Trifluoromethyl)iodobenzene)
d = 1.90 g/ml
[444-29-1] $C_7H_4F_3I$ FW 272.0
R: 34 S: 26-27-36/37/39

m-IODOBENZYLGUANIDINE — 5 mg 34.00; 25 mg 134.20
I 9890 2-8°C (MIBG)
Hemisulfate Salt
Antitumor agent which inhibits ADP ribosylation.
Ref.: 1. Smets, L.A., et al., Cancer Chemother. Pharmacol., **21**, 9 (1988).
2. Loesberg, C., et al., Biochim. Biophys. Acta, **1037**, 92 (1990).
[80663-95-2] $C_8H_{10}IN_3 \cdot 1/2H_2SO_4$ FW 324.1

IODOCHLOROHYDROXYQUINOLINE
See: 5-Chloro-7-iodo-8-hydroxyquinoline *Page 270*

3β-IODO-5-CHOLESTENE
See: Cholesteryl Iodide *Page 284*

19-IODO-5-CHOLESTEN-3β-OL 3-ACETATE
See: 19-Iodocholesterol 3-Acetate *Page 636*

19-IODOCHOLESTEROL 3-ACETATE — 1 mg 44.95
I 8255 -0°C (5-Cholesten-19-iodo-3β-ol 3-acetate; 19-Iodo-5-cholesten-3β-ol 3-acetate)
Approx. 95%
Crystalline
[4561-90-4] $C_{29}H_{46}IO_2$ FW 553.6

5-IODOCYTIDINE — 25 mg 27.75; 100 mg 73.40
I 6128 -0°C (4-Amino-2-hydroxy-5-iodo-1β-D-ribofuranosylpyrimidine)
Crystalline
[1147-23-5] $C_9H_{12}IN_3O_5$ FW 369.1

5-IODOCYTIDINE 5′-TRIPHOSPHATE — 5 mg 21.35; 25 mg 70.20
I 5628 -20°C
Sodium Salt
Approx. 95%
[118357-27-0] $C_9H_{15}IN_3O_{14}P_3$ FW 609.1 (for free acid)

5-IODOCYTOSINE — 100 mg 8.35; 500 mg 23.05; 1 g 37.65; 5 g 121.35
I 6875 -0°C (4-Amino-2-hydroxy-5-iodopyrimidine)
Crystalline
[1122-44-7] $C_4H_4IN_3O$ FW 237.0

5′-IODO-5′-DEOXYADENOSINE — 100 mg 40.75
I 5883 -0°C
Minimum 95%
Crystalline
[4099-81-4] $C_{10}H_{12}IN_5O_3$ FW 377.1

5-IODO-2′-DEOXYCYTIDINE — 100 mg 15.20; 1 g 86.35; 5 g 341.80
I 7000 -0°C **Crystalline**
[611-53-0] $C_9H_{12}IN_3O_4$
FW 353.1

5-IODO-2′-DEOXYCYTIDINE 5′-TRIPHOSPHATE — 1 mg 20.75; 5 mg 68.35
I 8261 -0°C
Sodium Salt
Approx. 95%
[31747-59-8] $C_9H_{15}IN_3O_{13}P_3$ FW 593.1 (for free acid)
R: 23/24/25-36/37/38 S: 26-36-22

PRODUCT NUMBER			US $
I 7509 [-0°C]	**p-IODO-D-PHENYLALANINE** (2-Amino-3-[4-iodophenyl]-propanoic acid) *[62561-75-5]* $C_9H_{10}NO_2I$ FW 291.1	1 g	127.70
I 4628 [RT]	**p-IODO-DL-PHENYLALANINE** (2-Amino-3-[4-iodophenyl]propanoic acid) **Crystalline** *[14173-41-2]* $C_9H_{10}INO_2$ FW 291.1	100 mg 500 mg 1 g 5 g	6.30 17.90 31.50 123.30
I 8757 [-0°C]	**p-IODO-L-PHENYLALANINE** (2-Amino-3-[4-iodophenyl]-propanoic acid) *[24250-85-9]* $C_9H_{10}INO_2$ FW 291.1	500 mg 1 g 5 g	26.80 48.20 190.70
I 2146	**4-(o-IODOPHENYL)BUTYRIC ACID** *[159002-37-6]*		Inquire
I 5634 [2-8°C]	**4-(p-IODOPHENYL)BUTYRIC ACID** *[27913-58-2]* $C_{10}H_{11}IO_2$ FW 290.1	500 mg 1 g 5 g	15.75 27.60 105.75
	2-(p-IODOPHENYL)-3-p-NITROPHENYL-5-PHENYLTETRAZOLIUM CHLORIDE *See:* p-Iodonitrotetrazolium Violet (INT) *Page 637*		
I 0256 [2-8°C]	**IODOPLATINATE SPRAY REAGENT** 0.15% Potassium chloroplatinate and 3% potassium iodide in dilute hydrochloric acid. For use in the detection of alkaloids, amines and organic nitrogen compounds. R: 40-36/37/38 S: 26-36	100 ml	23.00
I 9882 [RT]	**1-IODOPROPANE** **Approx. 99%** **Stabilized with copper.** d = 1.74 g/ml *[107-08-4]* C_3H_7I FW 170.0 R: 10-45-36/37/38 S: 16-45-26-36/37/39	100 ml	30.50
I 0133 [RT]	**2-IODOPROPANE** (Isopropyl iodide) **Stabilized with copper.** d = 1.70 g/ml Possible carcinogen. *[75-30-9]* C_3H_7I FW 170.0 R: 10-20/21/22-36/37/38-40 S: 16-26-36-23	100 g	15.55
I 7875 [2-8°C]	**6-IODOPURINE** **Crystalline** *[2545-26-8]* $C_5H_3IN_4$ FW 246.0	1 g	18.10
I 6003 [RT]	**4-IODOPYRAZOLE** **Crystalline** *[3469-69-0]* $C_3H_3IN_2$ FW 194.0 R: 42/43-40 S: 26-36-22	10 g	64.20
I 8000 [RT]	**o-IODOSOBENZOIC ACID** (2-Iodosobenzoic acid) **Crystalline** *[304-91-6]* $C_7H_5IO_3$ FW 264.0 R: 36/37/38 S: 26-36	1 g 5 g	8.15 32.20
I 3761 [-20°C]	**9(10)-IODOSTEARIC ACID** **98+%** *[112966-11-7]* $C_{18}H_{35}IO_2$ FW 410.4	500 mg	43.25
I 3886 [-20°C]	**9(10)-IODOSTEARIC ACID METHYL ESTER** **Approx. 97%** *[112897-95-7]* $C_{19}H_{37}IO_2$ FW 424.4	250 mg 500 mg 1 g	31.65 56.30 100.90
I 7142 [2-8°C]	**N-IODOSUCCINIMIDE** **Minimum 95%** Orange powder. *[516-12-1]* $C_4H_4INO_2$ FW 225.0 R: 20/21/22 S: 26-36	1 g 5 g 10 g	9.65 25.40 45.70
	IODOTRIMETHYLSILANE *See:* Trimethyliodosilane *Page 1091*		

PRODUCT NUMBER			US $
I 8250 [-0°C]	**3-IODO-L-TYROSINE** (3-Monoiodo-L-tyrosine) **Crystalline** Contains approx. 5% tyrosine. *[70-78-0]* $C_9H_{10}INO_3$ FW 307.1	1 g 5 g 25 g	20.15 67.05 223.45
	L-m-IODOTYROSINE *See:* 3-Iodo-L-tyrosine *Page 638*		
I 5016 [RT]	**5-IODOURACIL** (2,4-Dihydroxy-5-iodopyrimidine) **Minimum 98%** *[696-07-1]* $C_4H_3IN_2O_2$ FW 238.0 R: 46-20/21/22-36/37/38 S: 45-26-36/37/39-22	1 g 5 g 10 g 25 g	5.90 15.45 25.60 56.25
I 7500 [2-8°C]	**5-IODOURIDINE** (2,4-Dihydroxy-5-iodo-1-β-D-ribofuranosylpyrimidine) **Crystalline** *[1024-99-3]* $C_9H_{11}IN_2O_6$ FW 370.1	250 mg	13.40
I 8378 [-0°C]	**5-IODOURIDINE 5'-MONOPHOSPHATE** **Sodium Salt** **Approx. 98%** **Crystalline** *[103404-82-6]* $C_9H_{12}IN_2O_9P$ FW 450.1 (for free acid)	5 mg	15.45
I 3012 [-0°C]	**5-IODOURIDINE 5'-TRIPHOSPHATE** **Sodium Salt** **Approx. 95%** *[73431-55-7]* $C_9H_{14}IN_2O_{15}P_3$ FW 610.0 (for free acid) R: 23/24/25-36/37/38-42/43-40 S: 45-26-36/37/39	1 mg 10 mg	18.50 101.80
	IODOXYQUINOLINESULFONIC ACID *See:* 7-Iodo-8-hydroxyquinoline-5-sulfonic Acid *Page 637*		
I 0634 [2-8°C]	**IONOMYCIN** **Calcium Salt** **From Streptomyces conglobatus** Ca^{2+} ionophore that is more effective than A23187 as a mobile ion carrier for Ca^{2+}; non-fluorescent; used to study Ca^{2+} transport across biological membranes; induces apoptotic neuronal degeneration in embryonic cortical neurons **Ref.:** Toeplitz, B.K., et al., J. Am. Chem. Soc., **101**, 3344 (1979). *[56092-82-1]* $C_{41}H_{70}O_9Ca$ FW 747.1 R: 22 S: 36	1 mg 5 mg	59.80 231.55
I 3384 [2-8°C]	**α-IONONE** **Approx. 90% (GC)** d = 0.93 g/ml *[127-41-3]* $C_{13}H_{20}O$ FW 192.3 R: 42/43 S: 36	100 g	25.25
I 6381 [2-8°C]	**β-IONONE** (4-[2,6,6-Trimethyl-1-cyclohexen-1-yl]-3-buten-2-one) **Minimum 95% (GC)** d = 0.95 g/ml *[79-77-6]* $C_{13}H_{20}O$ FW 192.3 R: 42/43 S: 36	25 ml 100 ml	13.65 22.50
I 1147 [2-8°C]	**IONOPHORES** **FlukaBrand Selectophore®** Selectophore ionophores and cocktails are use-tested for production of reliable and accurate ion-selective electrodes. **Ammonium Ionophore I Cocktail A** R: 10-23/24/25 S: 16-45-36/37/39-23	0.1 ml	185.20

(Continued)

Attachment 3

	Peptide sequence	Reference
1	RLEYYENEKK	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
2	KRGEEELSNYICMGGK	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
3	KKVSIEEYTEMMPAK	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
4	KKHTDDGYMPMSPGVA	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
5	RKGNGDGYMPMSPKSV	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
6	KKRVDPNGYMMMSPSGS	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
7	KKKLPATGDYMNMSPVGD	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992. Hubbard, *EMBO J* 16:5573-5581, 1997.
8	KKGSEEYMNMDLGPGR	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
9	KKSRGDYMTMQIG	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
10	KPRNSYVDTSPVAPK	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
11	KKSRGNYMTMQIG	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
12	KKSRGDYITMQIG	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
13	KKSRGDYTTMQIG	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.

	Peptide sequence	Reference
14	KKSRGDY(Nle[1])TMQIG	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
15	KKSRGDYMTTQIG	Shoelson *et al.*, *Proc. Natl. Acad. Sci. USA* 89:2027-2031, 1992.
16	TRDIYETDYYRK	Stadmauer *et al.*, *J Biol. Chem.* 261:10000-10005, 1996.
17	LFASSNPEYLSARR	Stadmauer *et al.*, *J Biol. Chem.* 261:10000-10005, 1996.
18	KRSYEEHIPYTHMNGGK	Stadmauer *et al.*, *J Biol. Chem.* 261:10000-10005, 1996.
19	SRYMEDSTYYKASKG	Baron *et al.*, *J. Biol. Chem.* 273:7162-7168, 1998.

[1] Norleucine

Attachment 4

	Peptide sequence	Kinase	Reference
20	PLSRTLSVSS	PKC[2]	Kwon *et al.*, *J. Biol. Chem.* 269:4839-4844, 1994.
21	PLSRTLSV	PKC	Kwon *et al.*, *J. Biol. Chem.* 269:4839-4844, 1994.
22	PLSRTLS	PKC	Kwon *et al.*, *J. Biol. Chem.* 269:4839-4844, 1994.
23	PLRRTLSVAA	PKC	Kwon *et al.*, *J. Biol. Chem.* 269:4839-4844, 1994.
24	PLSRRLSVAA	PKC	Kwon *et al.*, *J. Biol. Chem.* 269:4839-4844, 1994.
25	KKKKKRFSFKKAFKKLA-GFAFKKNK	PKC	Kwon *et al.*, *J. Biol. Chem.* 269:4839-4844, 1994.
26	DEDADIYDEEDYDL	CK2[3]	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.
27	DEDADIYDEADYDL	CK2	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.
28	DEDADIYDAEDYDL	CK2	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.
29	DEDADIYAEEDYDL	CK2	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.
30	DEDADDYDEEDYDL	CK2	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.
31	DEDADISDEEDYDL	CK2	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.

[2] Protein Kinase C
[3] Casein kinase-2

	Peptide sequence	Kinase	Reference
32	DEDADDSDEEDYDL	CK2	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.
33	DEDADISAEEDYDL	CK2	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.
34	DEDADISDEADYDL	CK2	Marin *et al.*, *J. Biol. Chem.* 274:29260-29265, 1999.
35	RRREEEEESAAA	GRK2[4]	Onorato *et al.*, *J. Biol. Chem.* 270:21346-21353, 1995.
36	VSRSGLYRSPSMPENLNRP-RL	Chk1[5]	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
37	LNRSRLYRSPSMPEKLDR-MPL	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
38	TPRRTLFRSLSCTVETPLA-NK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
39	YLRPNVSRSRSSGNAPPFL-RS	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
40	QDTPVVRRTQSMFLNST-RLGL	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
41	RLYRSPSMPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
42	ALYRSPSMPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
43	RAYRSPSMPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
44	RLARSPSMPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.

[4] G protein coupled receptor kinase
[5] Checkpoint kinase-1

	Peptide sequence	Kinase	Reference
45	RLYASPSMPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
46	RLYRAPSMPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
47	RLYRSASMPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
48	RLYRSPAMPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
49	RLYRSPSAPEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
50	RLYRSPSMAEKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
51	RLYRSPSMPAKLD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
52	RLYRSPSMPEALD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
53	RLYRSPSMPEKAD	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
54	RLYRSPSMPEKLA	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
55	RLYRAPSMPEKLDRK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
56	RLARAASMAAALARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
57	RVARAASMAAALARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
58	RMARAASMAAALARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.

	Peptide sequence	Kinase	Reference
59	RRARAASMAAALARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
60	RIARAASMAAALARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
61	RAARAASMAAALARM	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
62	RLAKAASMAAALARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
63	RLAAAASMAAALARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
64	RLARAASMAAAAARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
65	RLARAASMAAAIARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
66	RLARAASMAAAVARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
67	RLARAASMAAAALRK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
68	RLARAASMAALAARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
69	RLARAASAAAAAARK	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
70	RKRLARAASMAAALA	Chk1	Hutchins *et al.*, *FEBS Lett.* 466:91-95, 2000.
71	SAVGFNEMEAPTTAYK	Lyn[6]	Yamanashi *et al.*, *Proc. Natl. Acad. Sci. USA* 90:3631-3635, 1993.

[6] Cellular Lyn protein kinase

	Peptide sequence	Kinase	Reference
72	KKLIEDAGYAARG	c-Abl[7]	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
73	KKLIEDAIYAARG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
74	KKLIEDALYAARG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
75	KKLIEDAHYAARG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
76	KKLIEDAAYAARG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
77	KKLIEDAKYAARG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
78	KKLIEDAQYAARG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
79	KKSRGDYMTMQIG	c-Abl, v-Abl[8], v-Src[9]	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999; Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
80	KKSRGDYITMQIG	c-Abl, v-Abl, v-Src	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999; Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
81	KKSRGDY(Nle)[10]TMQIG	c-Abl, v-Abl, v-Src	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999; Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.

[7] Cellular Abl protein kinase
[8] Viral Abl protein kinase
[9] Viral Src protein kinase
[10] Norleucine

	Peptide sequence	Kinase	Reference
82	KKSRGDYATMQIG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
83	KKSRGDYETMQIG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
84	KKSRGDYMTPQIG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
85	KKSRGDYMTTQIG	c-Abl, v-Abl, v-Src	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999; Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
86	KKSRGDYMTAQIG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
87	KKSRGDYMTEQIG	c-Abl	Till *et al.*, *J. Biol. Chem.* 274:4995-5003, 1999.
88	KKHTDDGYMPMSPGVA	v-Src, v-Abl	Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
89	RKGNGDGYMPMSPKSV	v-Src, v-Abl	Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
90	KKRVDPNGYMMMSPSGS	v-Src, v-Abl	Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
91	KKKLPATGDYMNMSP-VGD	v-Src, v-Abl	Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
92	KKGSEEYMNMDLGPGR	v-Src, v-Abl	Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
93	KKKEEEEEEYMPMEDL	v-Src, v-Abl	Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.

	Peptide sequence	Kinase	Reference
94	KKSRGNYMTMQIG	v-Src, v-Abl	Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
95	KKSRGDYTTMQIG	v-Src, v-Abl	Garcia *et al.*, *J. Biol. Chem.* 268:25146-25151, 1993.
96	ADFGLARLIEDNEYTARG	c-Src[11], Hck[12]	Silicia *et al.*, *J. Biol. Chem.* 273:16756-16763, 1998.
97	AEEEIYGEFEAKKKK	c-Src, Hck	Silicia *et al.*, *J. Biol. Chem.* 273:16756-16763, 1998.
98	AEEEAYGEAEAKKKK	c-Src, Hck	Silicia *et al.*, *J. Biol. Chem.* 273:16756-16763, 1998.
99	AEVIYAAPFAKKKK	c-Src, Hck	Silicia *et al.*, *J. Biol. Chem.* 273:16756-16763, 1998.
100	KVEKIGEGTYGVVYK	c-Src, Hck	Silicia *et al.*, *J. Biol. Chem.* 273:16756-16763, 1998.
101	KVEKIGEGTYGVVKK	c-Src, Hck	Silicia *et al.*, *J. Biol. Chem.* 273:16756-16763, 1998.
102	KVEKIGVGSYGVVKK	c-Src, Hck	Silicia *et al.*, *J. Biol. Chem.* 273:16756-16763, 1998.

[11] Cellular Src protein kinase
[12] Src-like protein kinase